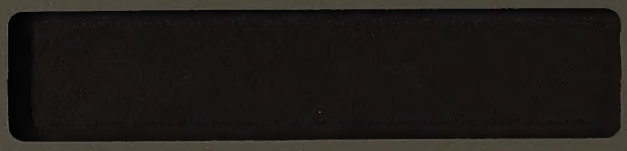
SYSTRON DONNER

A THORN EMI company

[redacted]



SYSTRON DONNER
Member THORN EMI Group

MODEL F7P200-15

INSTRUMENT DIVISION

OPERATING AND SERVICE MANUAL

3000 WATT DC POWER SUPPLY

MODEL F7P200-15

2727 Systron Drive • Concord, California 94518 • U.S.A.
Tel: (415) 676-5000 • TWX: 910-481-9479 • Cable: SYSTRON DONNER
FSCM No. 52542

Copyright © 1982 Systron Donner
Printed in U.S.A.

SYSTRON DONNER
INSTRUMENT DIVISION
2727 Systron Drive
Concord, California 94518

WARRANTY POLICY

I Warranty

Systron Donner Instrument Division warrants that at the time of shipment the products manufactured by Systron Donner and sold hereunder will be free from defects in material and workmanship and will conform to the current specifications published by Systron Donner's Instrument Division.

II Warranty

A The warranty period will be one year from the date of shipment. This warranty is extended only to the original buyer.

III Warranty Adjustments

A. If any defect within this warranty appears, Purchaser shall notify Seller immediately.

B Systron Donner agrees to repair or furnish a replacement for, but not install, any product which within the standard warranty shall, upon test and examination by Systron Donner, prove defective within the above warranty period.

C No product will be accepted for return or replacement without prior approval of Systron Donner. Upon such authorization and in accordance with instructions of Systron Donner, the product will be returned to the manufacturing location, shipping charges prepaid by Purchaser.

IV Exclusions from Warranty

A The foregoing warranty is in lieu of and excludes all other expressed or implied warranties of merchantability or fitness or otherwise.

B Systron Donner will not be liable for any special or consequential damages or for loss, damages or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with any other equipment or material, or from any other cause.

C The warranty does not extend to any product manufactured by Systron Donner which has been subjected to misuse, neglect, accident, improper installation or to use in violation of instructions furnished by Systron Donner.

D The warranty does not extend to or apply to any unit which has been repaired or altered at any place other than Systron Donner; by persons not expressly approved by Systron Donner; not to any unit, the serial number of which has been removed or defaced or Changed.

E This warranty applies to new equipment only and will cover repaired or replacement items only to the extent of the balance remaining of the items original warranty period noted in Paragraph II.

F All freight charges will be paid for by the Purchaser.

June, 1985

WARNING

USE ONLY ISOLATED TEST EQUIPMENT ON THIS UNIT.
ALL INTERNAL CIRCUITS ARE FLOATING ABOVE GROUND.
SERIOUS DAMAGE MAY OCCUR TO BOTH SUPPLY AND TEST
EQUIPMENT IF CIRCUIT GROUNDED.

I. INTRODUCTION
1.1 General Information
1.2 Specifications

II. INSPECTION AND INSTALLATION
2.1 Pre-Inspection
2.2 Unpacking
2.3 Post Inspection
2.4 Installation

III. OPERATION
3.1 Controls and Indicators
3.2 Modes of Operation

IV. CIRCUIT DESCRIPTION
4.1 General Description
4.2 Basic Operation
4.3 Control Adapter Operation
4.4 Output Switching

V. MAINTENANCE
5.1 Routine Maintenance
5.2 Calibration and Adjustment
5.3 Troubleshooting

ADDENDUM
SCHEMATICS AND PARTS LIST

INTRODUCTION

General Information

The Systron Donner model F7P200-15 is a modification of a basic 200 volt, 15 ampere switching regulated supply manufactured by Power Ten, Inc. The unit has been placed in a deeper chassis to accomodate the additional filtering, output switching and control circuitry required. Front panel local controls for voltage and current limit have been removed as has the rear mounted barrier strip for remote control.

As configured, the supply is designed to be computer controlled via a programming card, model DAC-416, mounted in a model P-12 programmer unit. A 25 conductor cable connects the programmer to the rear mounted control connector of the supply. Controlled parameters include output voltage, current limit, over voltage shutdown level and state of the output disconnect relay. Digital status information is fed back to the programmer.

Specifications

Primary Power	208 VAC,3Ø,3 wire plus ground,60Hz
Power Factor	.90 Min.
Output Power	0 to 200V, 0 to 15A, 3000W max
Efficiency	85% Min.
Regulation	
Voltage	
Line (+/- 10%)	.1% of full scale
Load (Half to FL)	.1% of full scale
Ripple, at full load	
CV Mode	30 mV rms Max.
CC Mode	30 mV rms Max.
Transient Response (Half to FL or FL to half load)	+/- 1% of regulated output within 10 mSec Max.
Stability	+/- 0.5% Max/8hrs after warm-up and at fixed line, load and temperature
Temperature	
Operating	0°C to +50°C Ambient
Storage	-40°C to +85°C
Temperature Coefficient	+/- .03%°C over operating temperature range
Meters-Digital	Volts DC Amps DC
Controls	Main Power - ON/OFF Output Power - OFF/REMOTE Preset Voltage Limit - Read Preset Current Limit - Read
Size	6.97 in. high, 19.0 in. wide, approx. 24 in. deep

INTRODUCTION

General Information

The Systron Donner model F7P200-15 is a modification of a basic 200 volt, 15 ampere switching regulated supply manufactured by Power Ten, Inc. The unit has been placed in a deeper chassis to accomodate the additional filtering, output switching and control circuitry required. Front panel local controls for voltage and current limit have been removed as has the rear mounted barrier strip for remote control.

As configured, the supply is designed to be computer controlled via a programming card, model DAC-416, mounted in a model P-12 programmer unit. A 25 conductor cable connects the programmer to the rear mounted control connector of the supply. Controlled parameters include output voltage, current limit, over voltage shutdown level and state of the output disconnect relay. Digital status information is fed back to the programmer.

Specifications

Primary Power	208 VAC,3Ø,3 wire plus ground,60Hz
Power Factor	.90 Min.
Output Power	0 to 200V, 0 to 15A, 3000W max
Efficiency	85% Min.
Regulation	
Voltage	
Line (+/- 10%)	.1% of full scale
Load (Half to FL)	.1% of full scale
Ripple, at full load	
CV Mode	30 mV rms Max.
CC Mode	30 mV rms Max.
Transient Response (Half to FL or FL to half load)	+/- 1% of regulated output within 10 mSec Max.
Stability	+/- 0.5% Max/8hrs after warm-up and at fixed line, load and temperature
Temperature	
Operating	0°C to +50°C Ambient
Storage	-40°C to +85°C
Temperature Coefficient	+/- .03%°C over operating temperature range
Meters-Digital	Volts DC Amps DC
Controls	Main Power - ON/OFF Output Power - OFF/REMOTE Preset Voltage Limit - Read Preset Current Limit - Read
Size	6.97 in. high, 19.0 in. wide, approx. 24 in. deep

INSPECTION AND INSTALLATION

2.1 Pre-Inspection

Prior to unpacking, inspect the exterior of the packing containers for evidence of damage in shipment. If damage seems evident, immediately contact the carrier that delivered the unit and submit a damage report. Failure to do so could invalidate future claims.

2.2 Unpacking

Carefully unpack and remove all items. Save all packing materials until all inspections are complete. It is recommended that all packing material be saved for potential future use. Verify that all items listed on the packing slips have been received.

2.3 Post Unpacking Inspecting

Inspect all items for evidence of damage in shipment. If damage seems evident, immediately contact the carrier that delivered the equipment and file a claim. Failure to do so could invalidate future claims. Check the unit thoroughly for damaged or broken knobs, connectors or meters and that the external surface is not dented or damaged. Any external damage may be an indication of internal damage.

After visual inspection is complete, the unit is ready for installation.

2.4 Installation

The F7P200-15 power supply is designed to be mounted in a standard rack. Floating nuts are installed in each gusset for mounting slides. Slides may be Zero CTN series or chassis Trak CTS. The supply must be operated in the horizontal position because it utilizes a mercury relay for output switching. Also it is not advisable to operate the supply under-load continuously with the covers removed as the air flow pattern is not normal.

2.4.1. Power Connection

Prime power requirement is a nominal 208VAC, 3 phase, 60Hz, 3 wire plus safety ground. A neutral input line is not used. The ground connection is used for chassis ground and line filtering; it is not connected to the power transformer. The wires used should be sized to carry a nominal 10 amperes with minimal voltage drop. Power is applied directly to studs on the input line filter FL1 mounted through the rear panel. After connecting, be sure to replace the protective cover.

2.4.2. Control Connection

Control from the Programmer is brought in via a 25 conductor interconnect cable to a sub-miniature D connector on the real panel, J2. Spring clips are used to captivate the plug.

2.4.3. Output Connections

The DC output of the supply is provided by a 7-pin MS connector. The mating plug is an MS3106A-20-15P. Pin connections are as follows:

A	+V
B	+V
C	-V
D	-V
E	-Sense
F	+Sense
G	Chassis Gnd.

The sense lines must be connected to the Voltage output lines for proper operation and regulation of the supply.

If the output lines are short and/or the voltage drop in the wires of no consequence, local sensing may be used. In this case, the -S pin is jumpered to one of the -V pins and +S to one of the +V pins right at the connecting plug.

In most cases, however, it is desirable to use remote sensing. The sense leads are carried to the load so that regulation is maintained at that point. Current in the sense leads is normally less than 100 micro amperes. Even under fault conditions where one or both of the output power leads is open, the current in the sense leads cannot exceed 20 milli-amps. Thus small gage wire like #24 or #22 may be used. For other than short runs, these leads should be twisted and shielded with the shield tied to the ground pin (G) of the connector.

For proper regulation at the load with remote sensing, the voltage drop in each of the power leads must not exceed 1 volt. At least #12 wire should be used. For longer distances, two wires can be run in parallel. It is also possible to insert #10 stranded wire into the solder cup of the #12 pin in the connector.

OPERATION

3.1. Controls and Indicators

3.1.1. Main Power Circuit Breaker

A three pole circuit breaker located on the lower right side of the front panel controls application of prime power to the power supply. In the "OFF" position, voltage remains on the rear panel line filter and the circuit breaker. All other voltages inside the power supply are removed.

3.1.2. ON/OFF/REMOTE Switch

A single pole double throw switch located on the lower center section of the front panel controls the output of the power supply. The "ON" position energizes the power supply output. The "OFF" position de-energizes the output. The "REMOTE" position is the same as "ON".

3.1.3. Voltage Preset Switch

An unmarked momentary pushbutton switch located on the front panel below the voltmeter permits presetting the desired output voltage level prior to activating the output voltage. When swtich is depressed, the front panel digital voltmeter displays the preset voltage regulation level. When operating in current mode this switch permits checking the output voltage limit.

3.1.4. Current Preset Switch

An unmarked momentary pushbutton switch located on the front panel below the ammeter which permits presetting the desired output operating current prior to activating the DC output. When the switch is depressed, the front panel digital ammeter displays the preset current regulation level. When operating in voltage mode, this switch permits checking the output current limit.

3.1.5. Mode Indicators

The voltage and current mode indicators are located above the front panel voltmeter and ammeter respectively. When the power supply output is activated, either the current mode or the voltage mode indicator will illuminate indicating the operating mode of the power supply.

3.1.6. Digital Panel Meters

Two meters located on the front panel provide continuous monitoring of output voltage and current. When the preset switch is depressed, the corresponding meter reads the reference set levels.

3.2. Modes of Operation

3.2.1. Standby Mode

In the standby mode, (ON/OFF/REMOTE switch in OFF position), power is not applied to the load and the output control is de-energized. The front panel voltage/current mode indicators are off but the meters are operational. In this mode, operating voltage and/or current may be preset and read on panel meters when preset pushbuttons are depressed without power applied to the load.

3.2.2. Constant Voltage Mode

To operate in the voltage mode, the current control must be set greater than or equal to the required output current. The front panel voltage mode indicator will be illuminated when operating in this mode.

3.2.3. Constant Current Mode

To operate in this mode, the voltage control must be set greater than or equal to the required output voltage. The front panel current mode indicator will be illuminated when operating in this mode.

CIRCUIT DESCRIPTION

WARNING:

Before removing cover from unit, disconnect input power lines as lethal voltages are present. DO NOT attempt any repair or replacement of parts/ subassemblies while power is connected to rear panel. Allow ten (10) seconds minimum after power removal for discharge of storage capacitance before cover removal.

4.1. General Description

The power supply is a pulse-width modulated switching regulator which operates in a constant voltage or constant current mode. Output isolation to 500 VDC is provided by an input transformer. Input power is 208 VAC +/- 10%, 3 phase, 60Hz. A neutral input line is NOT used. The ground input is used for chassis only and is not internally connected to the power supply circuitry.

4.2. Basic Operation (Ref. schematic Power Supply)

Three phase AC power is routed through circuit breaker CB1 to the primary of input transformer T1. The power secondary of T1 is stepped up or down, depending on model, to provide a secondary voltage of 30 to 50% above the maximum output requirements. This AC voltage is rectified by BR1 and applied via a choke input filter L1 and C2 to the power switch assembly A2. The power switch assembly A2 pulse-width modulates the unregulated DC input and through output filter L2 and C1 provides a regulated DC output voltage or current.

4.2.1. Power Switch Assembly A2 (Ref. schematic Power Switch)

The function of the power switch is basically that of a pulse amplifier. The input pulse-width modulated signal is applied to Q2 base. The output current pulse is routed through Q10 (on high voltage models) and is applied to Q4 and Q5 which alternately provides (+) or (-) basedrive to switch transistor Q8 through Q6 and Q7.

Plus 6 VDC and Minus 5 VDC bias for circuit operation is provided by U1 and U2. Input bias power, 9/16 VAC, 30 is a secondary output of T1.

A leading-edge snubber (L1, CR5 and VR1) and trailing-edge snubber (CR6, R14 and C7) are utilized to minimize switching losses in the power switch transistor Q8.

4.2.2. Control Assembly A1 (Ref. schematic Control Assembly)

The primary function of the control assembly is to provide a logic-level pulse-width modulated signal to the power switch assembly as a function of input controls and error signals.

4.2.3. Voltage Control Circuits

The voltage control and monitor circuits consist of U1, S2, M1 and associated circuitry. U1-A is a buffer amp for the voltage error signal. U1-B is a buffer amp for the voltage control (set) signal. U1-C is the voltage reference amp. U1-D is the error amplifier.

S2 is the preset read (pushbutton) switch located below the voltmeter on the front panel which permits reading the voltage set level on the voltmeter M1 with the output voltage turned off.

4.2.4. Current Control Circuits

The current control and monitor circuits of U2, S3, and M2 operation is functionally the same as the voltage control except for gain (circuit calibration) and balance (meter zero) potentiometers which are defined in subsequent paragraphs.

4.2.5. Indicator Driver Circuits

Voltage and current mode indicators are driven by U4-A and U4-B. The Op amps differentially compare the outputs of the voltage and current error amps (U1-D and U2-D) to determine which is the controlling circuit and drive the appropriate LED indicator.

4.2.6. Pulse-Width Modulator Circuits

The pulse-width modulator and output current pulse drive consist of U5, Q5 and associated components. Basic circuit operation is as follows: error signal from U1-D or U2-D is diode coupled to U5 error amp input, pin 2. U5 converts this error signal to a pulse-width modulated signal which drives current source Q5. The output of Q5 provides drive to the power switch assembly A2.

4.2.7. Bias Enable Circuits

The bias enable circuits consist of U3-B and associated components. U3-B samples the unregulated DC bus voltage and inhibits operation until the bias voltage has reached a predetermined safe level.

4.2.8. ON/OFF Controls

The power supply contains two methods of ON/OFF control:

1. Front panel switch
2. Over voltage circuit on the A3 Control Adapter board.
   4.2.8.1 The local control is via a three (3) position front panel switch. The "ON" position is the same as remote. In the "OFF" position, the power supply output is deactivated. In the "REMOTE" position, the power supply is activated by an open collector 12V semiconductor A3Q2.

4.2.9. Bias Supplies

The (+) 12 VDC for control circuit operation and +5 VDC for digital meter operation are provided by IC regulators U1 and U2. Input power is from a secondary bias winding on T1.

4.3. Control Adapter Operation (Ref. schematic Power Supply)

The Control Adapter PC Assembly, A3, has been added in order to make the basic Power Ten supply compatible with the control philosophy of System 1001.

4.3.1. Voltage Control

The full scale analog control voltage from a standard DAC is +10.000 volts. The basic Power Ten unit uses +8.00V as full scale. Thus the resistor combinations R23-R24 and R25-R26 multiply the voltage and current control signals by 0.8 to give the correct values to the A1 control assembly.

The basic Power Ten unit does not have a common reference point for the control of both current and voltage. Two separate references were used but that is not compatible with the DAC. Therefore differential amplifier U3B is used. By making R9/(R6 + R7 + R8) = (R4 + R5)/(R1 + R2 + R3) = 1/25, this amplifier (1) scales the maximum differential sense voltage from 200 down to +8.00 and (2) refers that output to the same signal common (symbol at bottom of R5) as used by the current control circuitry on Control card A1, pin 14. On the Control card schematic note that C31 has been shorted by a jumper so that the current return or common is tied to the voltage common (pin 7). This also ties to I SENSE +, pin 18, which in turn connects to the output side tap of the current shunt, R1. This same common connects back to the DAC card.

The output of U3B is labeled $+S_N$, a positive sense voltage normalized to the same 8 volt full scale as the voltage control signal. It is used as the feedback to be compared against the control signal on A1. It can be measured on Test Point 2.

Diodes CR1 through CR4 are used to prevent the loss of feedback when the output relays are open or in the event that a sense lead should be open when the relays are closed. Without feedback, the supply will go to maximum output of about 260 volts. This could cause damage to a load. Diodes CR1 and CR3 are bandgap diodes. Current supplied through resistors R12 and R13 is sufficient to maintain a constant 2.5V across each of these diodes. If the +S lead is open, for example, the +V will rise about 2.5 volts or enough to overcome the back bias across CR3. CR4 will then conduct and supply the feedback signal in place of a current through R1. Similar action occurs through CR1 and CR2 should the -S lead be open.

4.3.2. Overvoltage and Sink Circuits

The +8V full scale feedback signal $+S_N$ is amplified and inverted by U3A to produce a -10V full scale signal at TP3 labeled $-S_N$. This signal is fed through R33 to the summing junction of U4B, the OV latch. The other input to this latch is from the OV DAC in the programmer where +10V represents 110% of full scale. At any limit setting, if the output of the supply causes $-S_N$ to exceed the OV control by more than 10%, the junction of U4-5 goes negative. The output at U4-7 rapidly integrates from +15V down to -15V. As it goes negative, feedback through CR13 and R35 cause the amplifier to latch in the negative output state. It can be reset by a computer RST command which causes a 3ms +5V pulse to be applied to R36.

A negative output from U4B turns off Q2 which shuts down the supply. The action is the same as switching the front panel ON/OFF/REMOTE switch to OFF. The other output connection from the latch turns on Q3. This activates the optoisolator U6 whose output is the OV flag which is fed back to the programmer.

The current sink circuit consists of the chassis mounted parts Q1, a power FET, and the series connected power resistors R3 and R4. Its main function is to turn on during down programming so as to help discharge the main filter capacitors C1 and C3 (refer to sheet 1 of the power supply schematic).

A3Q1 is normally turned on by the +5V SD signal coming from the relay board. Hence its collector is low and the sink FET is off. However, if the output of comparator U7, an open collector, turns on it will divert the base drive from Q1. This switches on the sink FET and places 100 ohms across the output of the supply. The comparator input is connected between the voltage control and the voltage feedback signals, which are normally equal in the voltage mode. The feedback signal is biased ten to fifteen millivolts negative by R40 and R41 and is connected to the inverting input. Thus the comparator output is high. On down programming, the control level goes below the feedback, turning the comparator on and hence the sink circuit. This condition remains until the supplies capacitors discharge down to the newly programmed level.

.4. Output Switching (Ref. schematics Power Supply and Relay Board)

Relays are provided to disconnect the output of the supply from the external load. They operate under program control in response to the commands OPN and CLS followed by the channel designation. The commands set or reset a storage latch on the DAC card which in turn supplies the low true close signal to the Relay board, A4. A two pole mercury relay on the board switches the sense leads. A larger mercury plunger relay mounted on the chassis switches the two power leads.

Referring to the board schematic, U2-10 is normally low so when the close signal goes true (low), the outputs 3 and 4 of gate U4 go high and turn on the relay drivers Q1 and Q2. Coil current of the power relay flows through the LED of optoisolator U6 to generate the closed flag which feeds back to the programmer.

Due to the different time constants on inputs 5 and 6 of exclusive OR gate U1, a pulse is generated to trigger one shot U2 whenever an Open or Close transition occurs. The 5 ms pulse from U2-10 is of no significance but the 160 ms pulse from U2-6 and buffered by U1-10 is used to shutdown drive to the basic supply whenever the relays are switching Open or Closed.

MAINTENANCE

.1. Routine Maintenance

Preventative maintenance for this equipment comprises of periodic visual inspection and routine cleaning.

Calibration and adjustments detailed below are not part of a regularly scheduled maintenance program, but are included for initial installation or systems integration purposes only.

5.1.1. Visual Inspection

At periodic intervals, the power supply should be inspected to permit early detection of wear or damage which, if properly corrected, will prevent equipment malfunction or failure. Inspections should include, but not be limited to, visual checks for wear, breaks, deterioration, fungus, excess moisture mounting integrity, and other similar defects. In a normal environment, inspection should be made at 90-day intervals. If the equipment is subject to severe environmental conditions, such as dusty input ambient air, temperature extremes, excessive shock or vibration, inspections should be performed on a weekly or monthly basis. Visual inspection items are listed in Table 5.1.

5.1.2. Routine Cleaning

The necessary materials and outline procedures for cleaning the power supply are listed in Table 5.2.

.2. Calibration (Ref. Control Assembly Drawing, Control Adapter PCB Assy Dwg)

5.2.1. Equipment Required

Test cable wired as shown in Fig. 5.1
Precision DVM
Shunt, 15A, .1%
Switch rated at 15A, 250V

TABLE 5.1

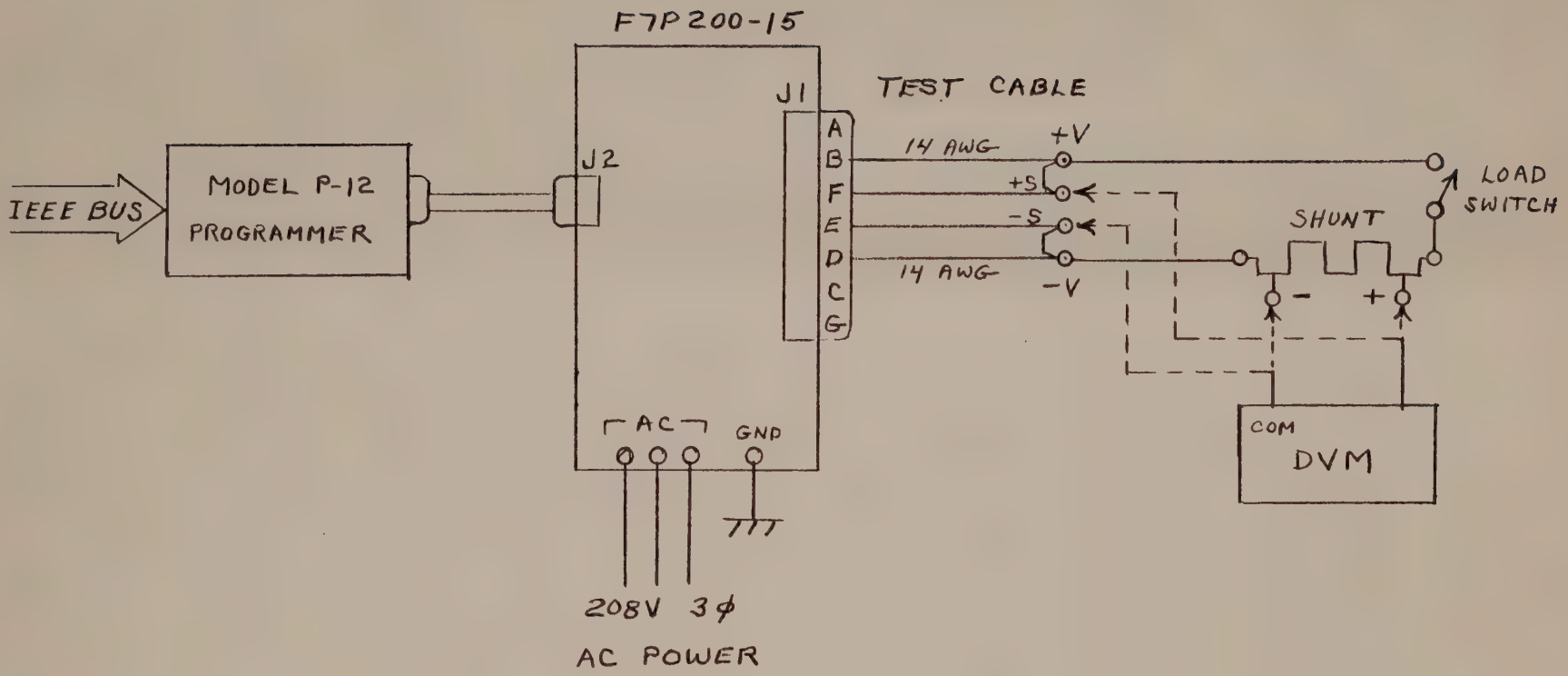
VISUAL INSPECTION ITEMS

Items	Potential Fault	Corrective Procedure
Connector Plugs	Damaged or improperly seated in mating connectors.	Replace connector plugs, properly seat replacement plug.
Electrical Wiring	Broken, burned or pinched.	Repair or replace defective wires.
Soldering Connections	Corroded, cracked or dirty.	Clean and resolder connections.
Dirt or Moisture Buildup	Short circuits, arcing, corrosion, overheating	Cleaning as required
Air Intake Filter	Excess dust or debris buildup.	Clean and/or replace, replace as necessary.

TABLE 5.2

ROUTINE CLEANING PROCEDURE

Item	Procedure
Chassis	Clean with lint-free cloth, small vacuum or low pressure compressed air.
Front Panel Controls and Meters	Use a dry, clean cloth, a soft bristle brush, or a cloth moistened with warm soap and water or a similar cleaning compound. Use a Kimwipe tissue (or equivalent) and GTC glass cleaning compound (or equivalent) to clean the meter faces.
Connector Jacks and Plugs	Remove dust and dirt with soft bristle brush, small vacuum or low pressure compressed air.
Air Intake Filter	Remove dust and dirt with soft bristle brush, small vacuum or low pressure compressed air.



TEST SETUP FOR CALIBRATION

FIGURE 5.1

5.2.2. Procedure

Prior to calibration disconnect line power from the unit. Remove the top cover. Remove the system output connector and configure the unit as shown in figure 5.1. The interconnect cable from J2 should go to a DAC-416 which should be in a calibrated condition. Reconnect power and turn the unit ON. Send a Reset command so the relays will be open and voltage at zero.

WARNING:

When cover is removed, high voltage is exposed in various places throughout power supply. Alignment and calibration must be accomplished by competent technical personnel only. Use insulated alignment tool and avoid any contact with circuit boards or components.

5.2.2.1. Voltage Circuits Calibration

With the Load Switch open, connect the DVM across the sense leads.
Send FNC DCS: CHn
SET VOLT 0
CLS :CHn

Note the DVM reading. It should be less than 0.5V, typically 0.25V. There is no zero adjustment.

Send SET VOLT 200
Adjust A3R5 ($+S_N$ CAL) so the DVM across the sense leads reads 200.00 +/- 0.05V
On A3 measure $+S_N$ between TP2 and TP1 (common). It should be 8.00 +/- 0.04V.
Note the actual reading and multiply by 0.9615. Meter at R8 pin 2 and adjust R8 for that value.

Check the 200V output and readjust A3R5 if necessary.

Meter at TP3 ($-S_N$) and adjust R14 for a reading of -10.000V.

The front panel voltmeter should be reading 200 +/- 4V (2%). If not, remove A1 from the front panel and adjust the pot on the panel meter assembly.

5.2.2.2. Current Circuits Calibration

Send OPN :CHn
Close the Load Switch and connect the DVM to the tap points on the shunt.

Send SET VOLT 2
SET CURL 0
CLS :CHn
Adjust A1R44 (middle pot on the right) for an output reading of 0.00A.

Send SET CURL 15
Adjust A1R48 (outside pot) for an output of 15.000 +/- 0.015A.

The front panel ammeter should be reading 15 .0 +/- 0.3A (2%). If not, remove A1 from the front panel and adjust the pot on the panel meter assembly.

Send RST DCS :CHn
Remove the test cable and equipment. Reconnect the system output cable and replace the top cover.

.3. Troubleshooting

The information and guidelines listed below are provided to assist in identifying power supply faults. Troubleshooting of power supply circuits should be attempted by qualified personnel only. Prior to any troubleshooting attempt, review circuit description in Section IV of this manual for a basic understanding of circuit functions.

During troubleshooting of power supply, remove all grounds or other reference voltage from output leads to allow power supply circuits to receive ground reference from ocilloscope. This will permit referencing ocilloscope ground to any power supply return or bias voltage without damage. The only circuits inside the power supply that cannot be grounded under these conditions are the AC input lines, fuses, power switch, blower and power transformer primary. All other circuits are isolated by transformer T1. Apply reference ground to only one circuit at a time.

WARNING:

Before removing cover from unit, disconnect input power lines as lethal voltages are present. DO NOT attempt any repair or replacement of parts/subassemblies while power is connected to rear panel. Allow ten (10) seconds minimum after power removal for discharge of storage capacitors before removal or access to any internal power supply circuits.

5.3.1. Troubleshooting Table

Fault	Probable Causes
a. Unit will not turn on	- No input power
b. Blower inoperative	- Open circuit breaker
c. Circuit breaker blows at power turn on	- BR1 shorted - C2 shorted - A2 shorted
d. No output from power supply	- Input voltage low - A1 defective - A2 defective
e. Voltage or current mode indicator do not work	- LED indicator defective - A1 - U4 defective
f. Voltage control inoperative, current OK	- A1 - U2 defective - Current sense leads open or shorted

g.	Current control inoperative, voltage OK	- A1 - U2 defective - Current sense leads open or shorted
h.	Remote AC/DC ON/OFF control inoperative	- Improper connections - A1 - BR2 or A1 - Q6 defective
i.	Panel meters do not illuminate	- A1 - U7 or A1 - BR1 defective - Broken AC bias wiring from T1 to A1-15

5.3.2 Troubleshooting the A1 Control Assembly

The first check should be a visual inspection for burned, cracked, discolored or loose components or any other obvious improper condition. Second, verify that proper bias voltages are present. The +12 volt bias can be read across C24 and +5 volt bias can be read across C25 with DC voltmeter. (Reference assembly drawing for component location and schematic for electrical connections).

Assuming bias voltages are OK, most other problems can quickly be solved by replacement of plug-in integrated circuits. These IC's are listed below with circuit functions to assist in identifying the faulty IC.

U-1	Voltage control & Ref. amp	LM324N
U-2	Current control & Ref. amp	LM324N
U-3	On/Off, bias enable, over-voltage Det/Latch	LM324N
U-4	Mode indicator detector/ driver	LM324N
U-5	Pulse-width modulator	SG3524

If troubleshooting-by-replacement described above does not resolve fault, then signal tracing with an ocilloscope is recommended.

5.3.3 Troubleshooting the A2 Power Switch Assembly

The first check should be a visual inspection for burned, cracked, discolored or loose components or any other obvious improper condition. Second, verify that proper bias voltage are present. The +6 volt bias may be accessed across C3 and the -5 volt bias across C4. (Reference assembly drawing for components location and schematic for electrical connections). Third, with the limited number of semiconductors on assembly A2, the recommended troubleshooting technique for expeditious repair is to remove it from chassis and check all semiconductors for a short or open junctions. The most likely failure on this assembly is Q8. If Q8 is shorted base-to-collector then there are likely other basedrive transistors (Q4 - Q7) failed. Q1, Q2 and Q3 only provide an active discharge circuit for input filter capacitor C2. (C2 is not located on the PWB assembly)

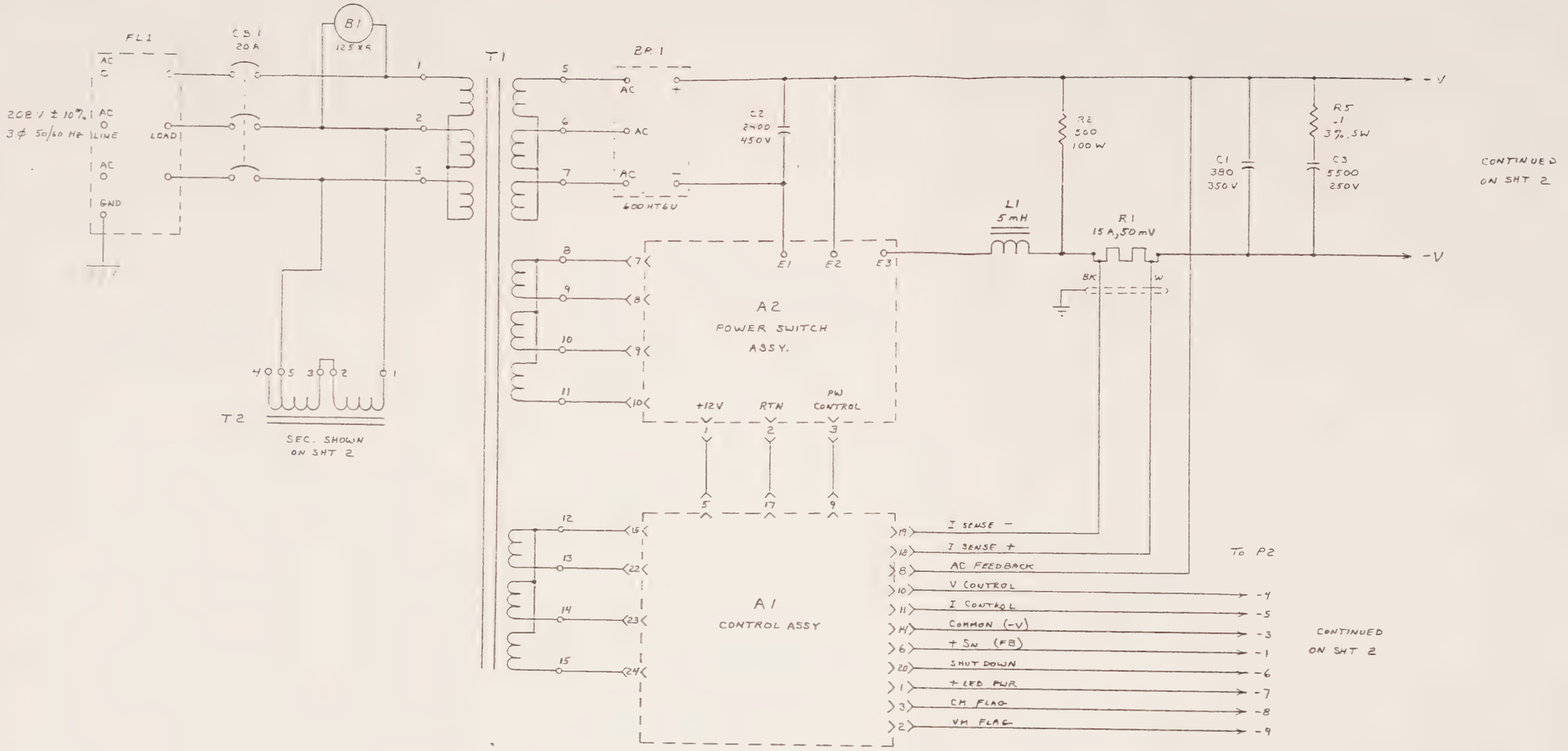
If none of the above checks define the problem area, then troubleshooting by signal flow and waveform analysis is recommended.

DRAWINGS & PARTS LISTS
FOR MODEL F7P200-15

Origin	Drawing Number	Description
SD	7 07928701	Schematic F7P200-7 Power Supply
SD	07928701	Assembly, Power Supply, F7P200-15
SD	07928701	Parts List, Power Supply, F7P200-15
SD	07932001	Assembly Pull Down
SD	07932001	Parts List, Pull Down
SD	07931601	Assembly Brkt Relay
SD	07931601	Parts List, Brkt Relay
SD	07931701	Assembly Panel Rear
SD	07931701	Parts List, Panel Rear
PT	LM3200D-20015	Parts List Pwr Supply Model 20015
PT	10010-012-91	Schematic Control Assembly A1
PT	10010-012-01	Assembly Control A1
PT	LM10010-012-01	Parts List Control A1
PT	10010-010-90	Schematic Power Switch Assy A2
PT	10010-010-00	Assembly Power Switch A2
PT	10010-010-00	Parts List Power Switch A2
SD	07928601	Assembly PC Control Adapter A3
SD	07928601	Parts List PC Control Adapter A3
SD	707904007	Schematic Relay Board Assy A4
SD	07904007	Assembly Relay Board A4
SD	07904007	Parts List Relay Board A4

SD: Systron Donner
PT: Power Ten

REVISIONS					
REV	DESCRIPTION	ECO NO.	LAL	DATE	APP'D BY
A	RELEASED TO RECORDS			10/56	



NOTE. ALL ITEMS SHOWN ON THIS SHEET ARE SUPPLIED BY POWER TEN EXCEPT C3, FL1, R2, R5, T2.

PROPRIETARY DATA
This document contains information which is proprietary to SYSTRON DONNER. The contents may not be used, copied, or divulged to other parties without written consent from an authorized representative of SYSTRON DONNER except in accordance with applicable Defense Acquisition Regulations

DRAWN	ASM 7-56	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
CHECK	DATE	DECIMAL TOLERANCE
ENG.	DATE	X ±
PROJECT	DATE	XX ±
QA	DATE	XXX ±
F7P200-15		ANGLES ±
USED ON		
MATERIAL		

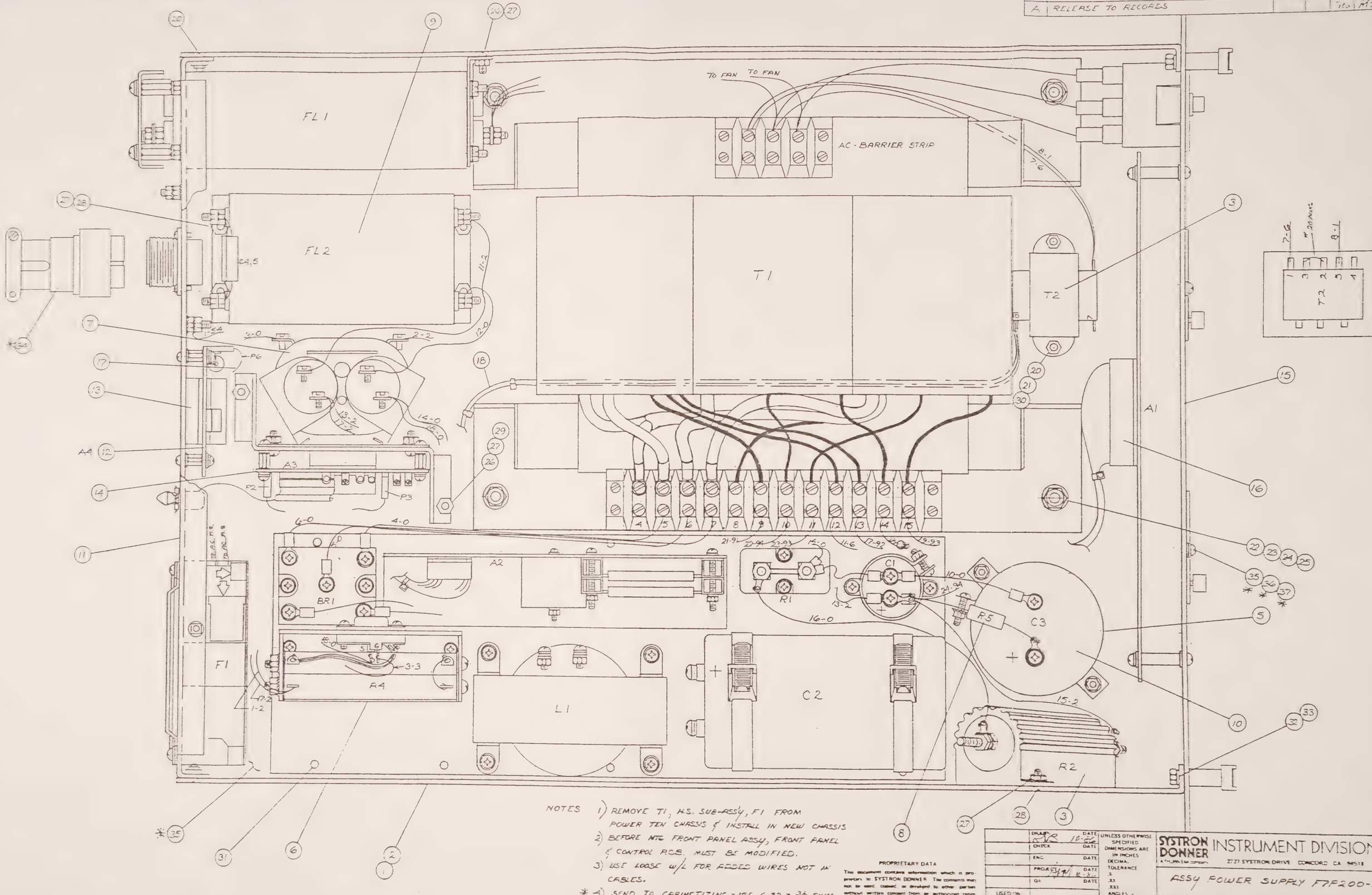
SYSTRON DONNER INSTRUMENT DIVISION
A TH AMY ESB COMPANY
2727 SYSTRON DRIVE CONCORD, CA 94518

SCHEMATIC
F7P200-15 POWER SUPPLY

SIZE	FSCM NO	DWG NO	REV
D	52542	7079237 01	E

SCALE — SHEET 1 OF 2

REVISIONS				
REV	DESCRIPTION	ECO NO	LAT	DATE / APP BY
A	RELEASE TO RECORDS			12-3 MH



NOTES
1) REMOVE T1, H.S. SUB-ASSY, F1 FROM POWER TEN CHASSIS & INSTALL IN NEW CHASSIS
2) BEFORE NTG FRONT PANEL ASSY, FRONT PANEL & CONTROL P.C.B. MUST BE MODIFIED.
3) USE LOOSE W/L FOR ADDED WIRES NOT IN CABLES.
* 4) SEND TO CABINETIZING - USE 6-32 x 3/8 PHMS & 8-32 x 1/2 PHMS FOR MTG. COVER.

PROPRIETARY DATA
This document contains information which is proprietary to SYSTRON DONNER. The contents may not be used, copied, or divulged to other parties without written consent from an authorized representative of SYSTRON DONNER except in accordance with applicable Contract Agreement Requirements.

		DATE
	DRAWN	10-6-72
	CHECK	DATE
	ENG	DATE
	PROJ	DATE
	QA	DATE
USED ON		
MATERIAL		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
X ±
XX ±
XXX ±
ANGLES ±

SYSTRON DONNER INSTRUMENT DIVISION
A THOMPSON-EMERSON
2727 SYSTRON DRIVE CONCORD CA 94518

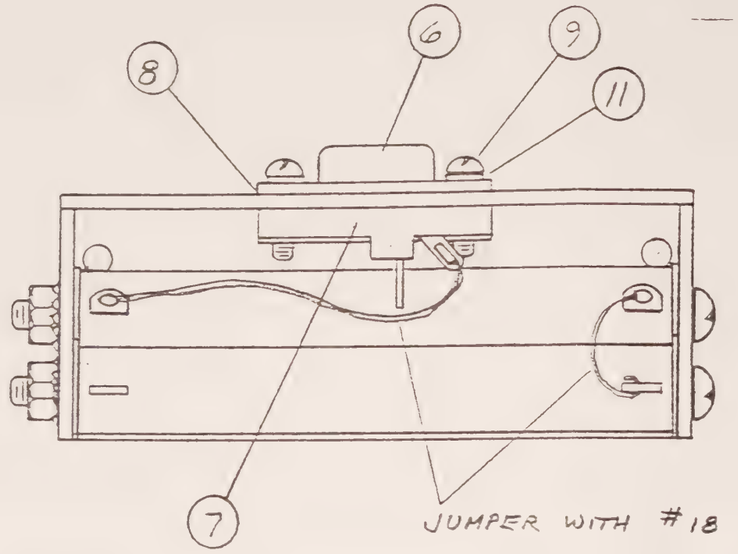
ASSY POWER SUPPLY F7F200-15

SIZE | FSCM NO. | DWG NO. | REV
B | 52542 | 679252 | A

0001	123653	PWR SUPPLY 0-200V 15A			1000	61987	SERIES 3200 MOD20015	EA	4	
0002	079314	FAB CHASSIS F7P200-15			1000	52542		EA	2	
0003	504366	XFMR AUX HRP SERIES	B155128	T2	1000	52542	504366	EA	2	A
0004	123717	RES WW PWR 500 OHM 100W		R2	1000		UAL-100	EA	4	
0005	123068	CLAMP CAP 3ID 2HOLE MTG			1000	00853	115058-01	EA	4	
0006	07932001	ASSY PULLDOWN F7P200-15	A-----A		1000	52542		EA	1	B
0007	07931601	ASSY BRKT RELAY F7P200-15	1-----1		1000	52542		EA	1	B
0008	630018	RES WW PWR.1 5W 3% 90PPM/C	D-----A	R5	1000	15915	TSA5	EA	4	V
0009	123654	FILTER RFI 20A 250V		FL2	1000	91514	STD-20	EA	4	
0010	123716	CAP EL CAN 5500UF 250V 3DX5.63		C3	1000		EMC552EL250S	EA	4	
0011	07931701	ASSY PANEL REAR F7P200-15	A-----A		1000	52542		EA	1	C
0012	07904007	ASSY PC RELAY SINGLE-POL EXTER	2-----2	A4	1000	52542		EA	1	B
0013	079056	FAB PCB SUPPORT	A-----A		2000	52542		EA	2	
0014	07928601	ASSY PC CONTROL ADAPTER F7P200	A-----A	A3	1000	52542		EA	1	C
0015	079319	FAB FRONT PNL MODIFICATION F7P	A-----A		1000	52542		EA	2	B
0016	07933801	ASSY CABLE A1-P2 F7P200-15	A-----A		1000	52542		EA	2	D
0017	07933701	ASSY CABLE P3-P6 F7P200-15	A-----A		1000	52542		EA	1	B
0018	07934001	ASSY CABLE P4-T2 F7P200-15	A-----A		1000	52542		EA	1	B
0019	5079341	W/L LOOSE F7200	A-----A		1000	52542		EA	1	A
0020	10073106	FHMS CRES 6-32 X3/8			20000	96906	MS24693-C26	EA	4	
0021	100862	NUT KEP 6-32 .34400 .14 THK CP			2000	78189	511-061800-00	EA	4	
0022	123744	FHMS 1/4-20X3/4 1000EG CDPS			4000		DY DESPRIPTION	EA	4	
0023	123507	NUT HEX CDPS 1/4-20 X .21TH .4			4000		BY DESC	EA	4	
0024	103636	FLAT WSHR .28ID .620 .06THK CD			4000		BY DESCR	EA	4	
0025	100730	SPLIT LOCK 1/4 .259ID.4890D CR			4000	96906	MS35338-139	EA	4	
0026	10074308	FHMS CRES 8-32 X 1/2			5000	96906	MS24693-C50	EA	4	
0027	100940	NUT KEP 8-32 .37500 .16THK C			9000	78189	511-081800-00	EA	4	
0028	10074306	FHMS CRES 8-32X.375			4000	96906	MS24693-C48	EA	4	
0029	100705	FLAT WSHR 8 .187 ID.375 OD CR			4000	96906	MS15795-807	EA	4	
0030	100704	FLAT WSHR 6 .156 ID.312 OD CR			2000	96906	MS15795-805	EA	4	
0031	10074324	FHMS CRES 8-32 X 1 1/2			6000	96906	MS24693-C58	EA	4	
0032	123354	HEX HD MS 10-32X1/2 CRES	-------		6000		BY DESCRIPTION	EA	4	
0033	100698	WASHER INT LOCK #10			6000	96906	MS35333-73	EA	4	
0034	123540	CONN CIRC 7 PIN #2 ST PLUG	A-----A		1000	96906	MS3106A20-15P	EA	4	
0035	079315	FAB COVER TOP F7P200-15			1000	52542		EA	2	
0036	10064208	PHMS CRES 8-32 X 1/2			2000	96906	MS51957-45	EA	4	
0037	100687	INT TOOTH #8 CRES			2000	96906	MS35333-72	EA	4	

SINGLE LEVEL EXPLOSION

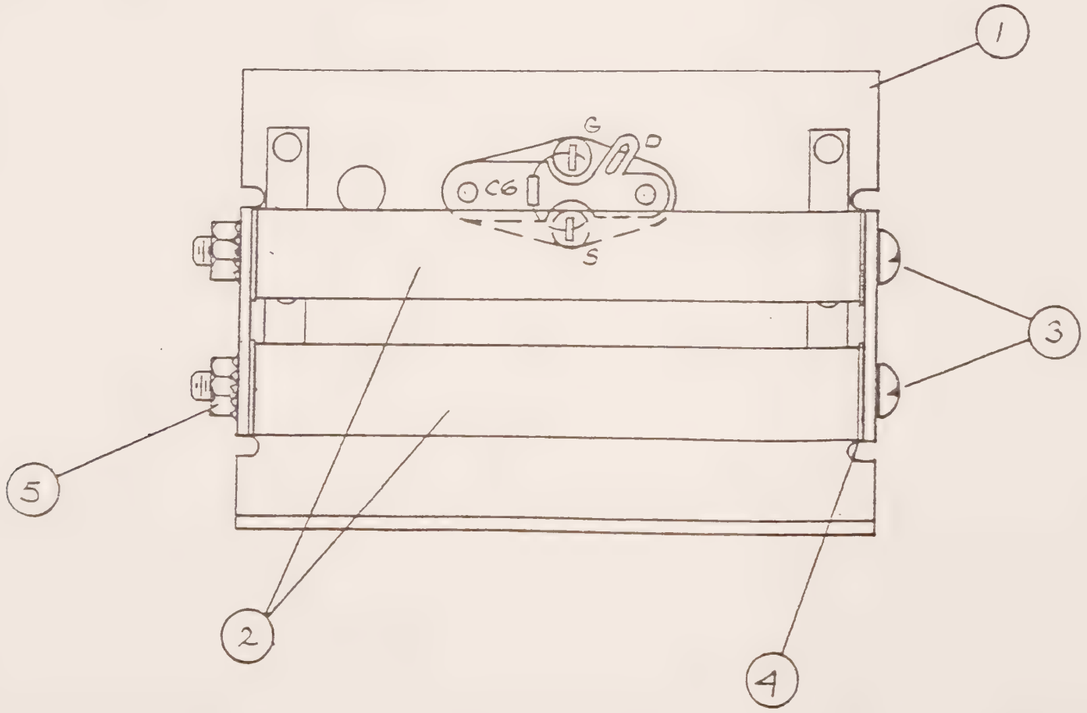
REVISIONS				
LTR	DESCRIPTION			
A	RELEASE TO RECORDS		10/96	HEM



JUMPER WITH #18 BUS & SLEEVE

NOTE 1) USE THERMAL COMPOUND P/N 100750 ON MICAWASHER

2) 10-32 X 4 1/2" RHMS ARE IN XFORMER SHOP.



LIST OF MATERIALS

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO

PROPRIETARY DATA

Protected under United States Government Contract No. _____. Should this contract terminate, this Government, or used therefor, or disclosed in whole or in part for manufacture or procurement, without the written permission of Systron-Donner Corporation except for its emergency repair or overhaul work by or for this Government, where the item or process concerned is not otherwise restricted, permission for unrestricted performance of the work or its disclosure to a foreign government, as the interests of the United States may require, permission shall be granted. This restriction does not affect rights of the Government under any contract clause which may be inconsistent herewith. This legend shall be marked on any reproduction hereof in whole or in part.

DRAWN	DATE
RB	
CHECK	DATE
ELECT.	DATE
MECH.	DATE
PROJECT	DATE
QA	12-3-96
D.O.	2-27-97

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
X ±
XX ±
XXX ±
ANGLES ±

SYSTRON DONNER CORPORATION
CONCORD, CALIFORNIA
CODE IDENT. 52542

ASSY PULLDOWN
F7P200-15

USED ON | NEXT ASSY
APPLICATION

SCALE FULL | DO NOT SCALE DRAWING | SH 1 OF 1

MATERIAL P/L 07932001

REF	SIZE	DRAWING NO. PART NO.	REV
	B	07932001	H

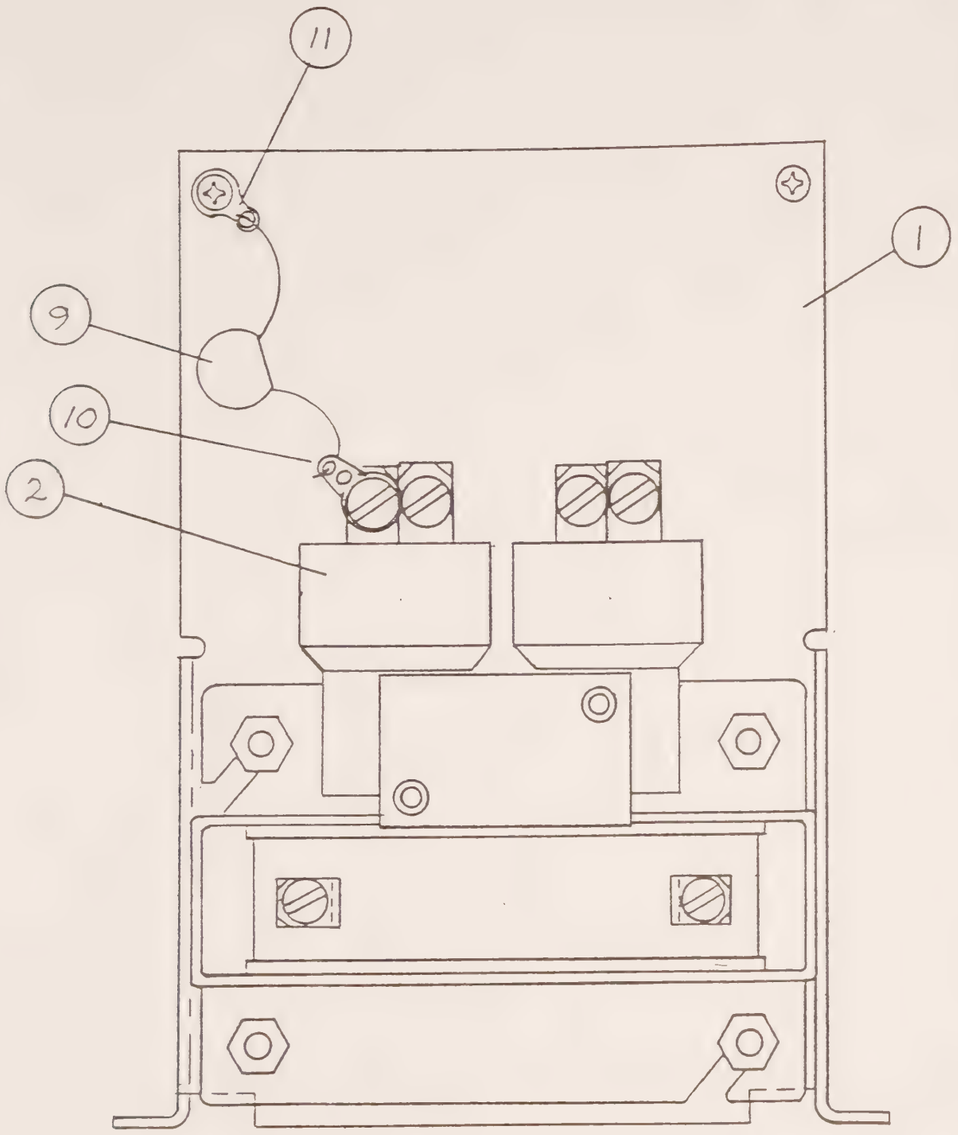
ASSY PULLDOWN F7P200-15 10/29/86 07932001 A-----A 10/07/86

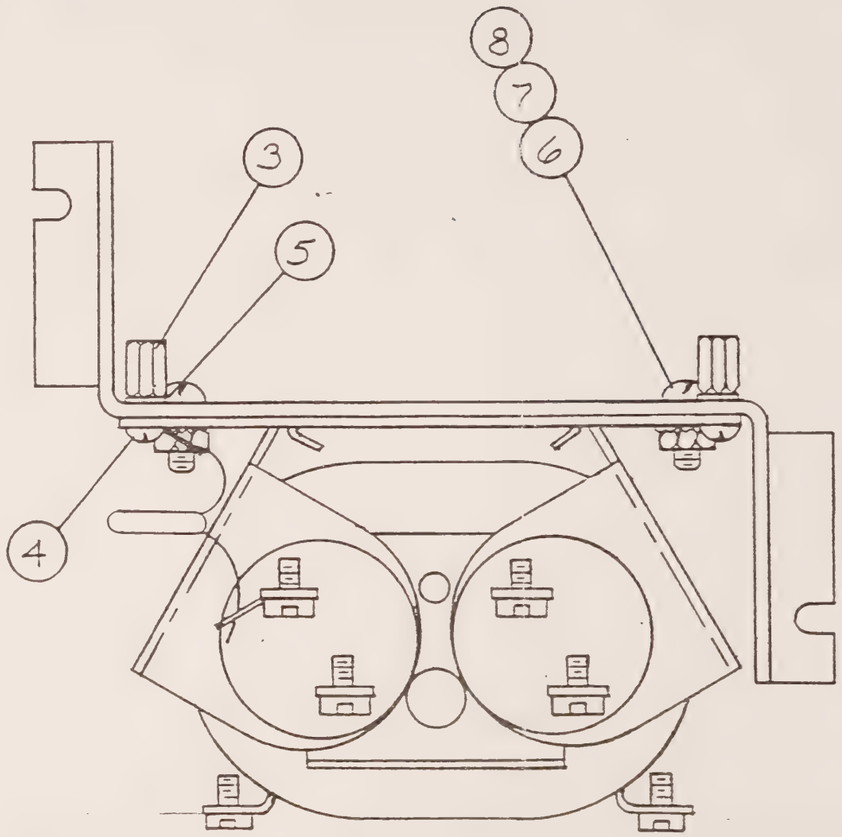
INSTRUMENT DIV 52542 1

0001	079320	FAB PLATE RES MTG			1000	52542		EA 2 B
0002	650460	RES WW PWR50 50W 5% OD9/16ID>5		R3,4	2000	30487	FVT50 50	EA 4 V
0003	10365772	RNDHDMS 10-32X4.50 CDPS			2000		BY DESCR	EA 4
0004	112638	FIBRE WSHRFLAT .190 ID.640 OD.			4000	86928	5602-87-16	EA 4
0005	100939	NUT KEP 10-32 .4060D .16TKK			2000	78189	511-10180C-50	EA 4
0006	11986001	MOSFET NCH IRF333 350V RDS<1.5	D-----B	Q1	1000	04713	IRF333	EA 4 V
0007	830099	SOCKT XSTR TO-3 DIAL PH SINGLE		XQ1	1000	06776	MD-3452-G	EA 4
0008	103358	INS XISTORTO-3 MICA.05LD.14MT	A-----A		1000	08289	DM-111	EA 4 V
0009	10063208	PHMS CRES 6-32 * 1/2			2000	96906	MS51957-30	EA 4
0010	100374	CAP C MOLD.01 UF 50V 10%		C6	1000	32159	G504BX103K	EA 4 V
0011	100647	INT TOOTH #6 CRES			2000	96906	MS35333-71	EA 4

SINGLE LEVEL EXPLOSION

A	RELEASE TO RECORDS		11/7/86 AGM





PROPRIETARY DATA

Furnished under United States Government Contract No. _____
Shall not be either released outside the Government, or used, duplicated, or disclosed in whole or in part for manufacture or procurement, without the written permission of Systron-Donner Corporation except for (1) emergency repair or overhaul work by or for the Government, where the item or process concerned is not otherwise reasonably obtainable to enable timely performance of the work, or (2) release to a Foreign government, as the interests of the United States may require, provided that in either case the release, use, duplication or disclosure hereof shall be subject to this restricting notice. The legend shall be marked on any reproduction hereof in whole or in part

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO.

LIST OF MATERIALS

DRAWN	RAB 8/6 DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.1 .XX ±.02 .XXX ANGLES ±	SYSTRON DONNER CORPORATION CONCORD, CALIFORNIA
CHECK	DATE		CODE IDENT. 52542
ENGR.	DATE		
MECH.	DATE		
PROJECT	10-8-86 DATE		
QA	DATE		
USED ON / NEXT ASSY	SCALE FULL	DO NOT SCALE DRAWING	SH 1 OF 1
APPLICATION			

ASSY BRKT RELAY F7P200-15

MATERIAL P/L 07931601

DRAWING NO. REF	SIZE	PART NO.	REV
	B	07931601	A

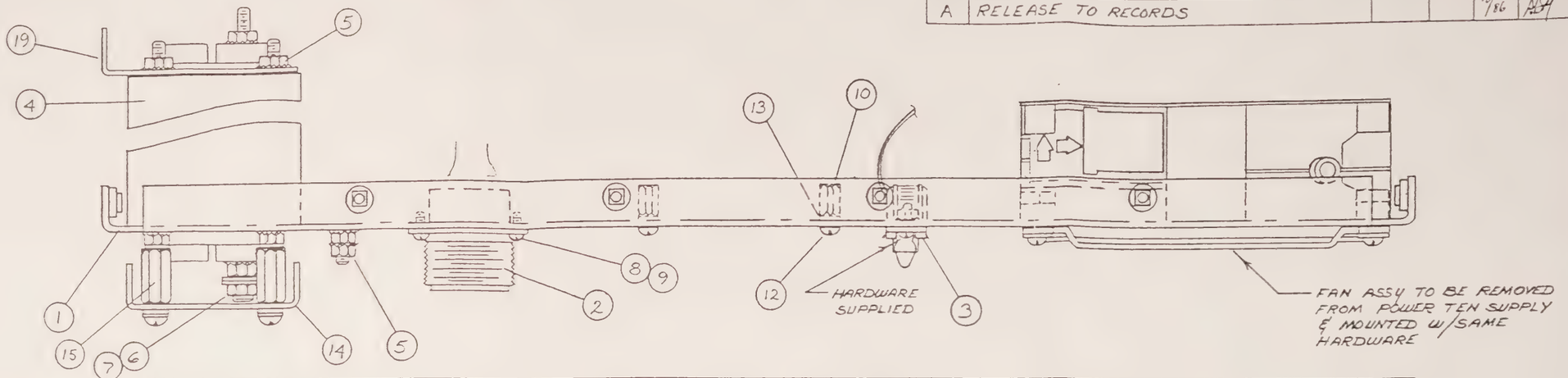
ASSY BRKT RELAY F7P200-15 10/30/86 07931601 1-----1 10/07/86

INSTRUMENT DIV 52542 1

0001	079316	FAB BRKT RELAY F7P200-15		1000	52542		EA 2
0002	123715	RELAY HG 24VDC 30A 2FA 95 OHM	K1	1000	73674	BF2-7032	EA 4
0003	102989	SPCR THRD06-32 3/8L X 1/4HEX A		2000	83330	8422	EA 4
0004	10063204	PHMS CRES 6-32 X 1/4		2000	96906	MS51957-26	EA 4
0005	100647	INT TOOTH #6 CRES		2000	96906	MS35333-71	EA 4
0006	10064206	PHMS CRES 8-32 X 3/8		2000	96906	MS51957-43	EA 4
0007	100705	FLAT WSHR 8 .187 ID.375 OD CR		2000	96906	MS15795-807	EA 4
0008	100940	NUT KEP 8-32 .3750D .16THK C		2000	78189	511-081800-00	EA 4
0009	100074	CAP C DISC.05 UF 600V +80-20%	A-----A C7	1000	91418	TYPE B	EA 4 V
0010	100989	LUG SOLDER #10INT TOOTH.69L2		1000	78189	2104-10-00	EA 4
0011	100486	LUG SOLDER#6INT TOOTH.72L 2HOL		1000	83330	1413-6	EA 4

SINGLE LEVEL EXPLOSION

REVISIONS					
REV	DESCRIPTION	ECO NO.	LAL	DATE	APP. BY
A	RELEASE TO RECORDS			1/86	



PROPRIETARY DATA

This document contains information which is proprietary to SYSTRON DONNER. The contents may not be used, copied, or divulged to other parties without written consent from an authorized representative of SYSTRON DONNER except in accordance with applicable Defense Acquisition Regulations

	DRAWN RLB DATE 8/86	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X .XX ~ .XXX ANGLES ±	SYSTRON DONNER INSTRUMENT DIVISION A THORN EMI company 2727 SYSTRON DRIVE CONCORD, CA 94518
	CHECK DATE		
	ENG. DATE		ASS'Y PANEL REAR F7P200-15
	PROJECT DATE 10/86		
	QA DATE		
USED ON			SIZE C | FSCM NO 52542 | DWG NO 07931701 | REV A
MATERIAL P/L 07931701			SCALE FULL | SHEET 1 OF 1

ASSY PANEL REAR F7P200-15 10/29/86 07931701 A-----A 10/07/86

INSTRUMENT DIV 52542 1

0001	079317	FAB PANEL REAR F7P200-15			1000	52542		EA 2
0002	07933401	ASSY CABLE OUPUT F7P2-15	A-----A		1000	52542		EA 2 B
0003	06585604	ASSY CABLE RIBBON F7P200-15	A-----A		1000	52542		EA 2 B
0004	123655	FILTER RFI 20A 3PH 250V		FL1	1000	91514	D20B	EA 4
0005	100940	NUT KEP 8-32 .3750D .16THK C			4000	78189	511-081800-00	EA 4
0006	100939	NUT KEP 10-32 .4060D .16TKK			4000	78189	511-101800-50	EA 4
0007	100648	FLAT WSHR 10 .218 ID.437 OD CR			8000	96906	MS15795-808	EA 4
0008	10062604	PHMS CRES 4-40 X 1/4			4000	96906	MS51957-13	EA 4
0009	100711	WSHR LOCK SPLT #4			4000	96906	MS35338-135	EA 4
0010	116920	SPCR THRDD6-32 7/16LX1/4HEX AL			2000	83330	9293	EA 4
0011	07382601	073827 MODEL/SERIAL/PART FOILC	A-----A		1000	52542		EA 4 A
0012	10063204	PHMS CRES 6-32 X 1/4			2000	96906	MS51957-26	EA 4
0013	100647	INT TOOTH #6 CRES			2000	96906	MS35333-71	EA 4
0014	079339	FAB AC COVER F7P200-15	A-----A		1000	52542		EA 2 A
0015	860290	SPCR THRDD 8-32X.625 .375 HEX			4000	06540	8575-SS-0832-7	EA 4
0016	10064208	PHMS CRES 8-32 X 1/2			4000	96906	MS51957-45	EA 4
0017	100687	INT TOOTH #8 CRES			4000	96906	MS35333-72	EA 4
0018	100705	FLAT WSHR 8 .187 ID.375 OD CR			4000	96906	MS15795-807	EA 4
0019	079318	FAB BRKT FILTER F7P200-15			1000	52542		EA 2

SINGLE LEVEL EXPLOSION

BILL OF MATERIALS WITHOUT BURDEN
POWER TEN INC.
FOR ASSEMBLY 3200D-20015

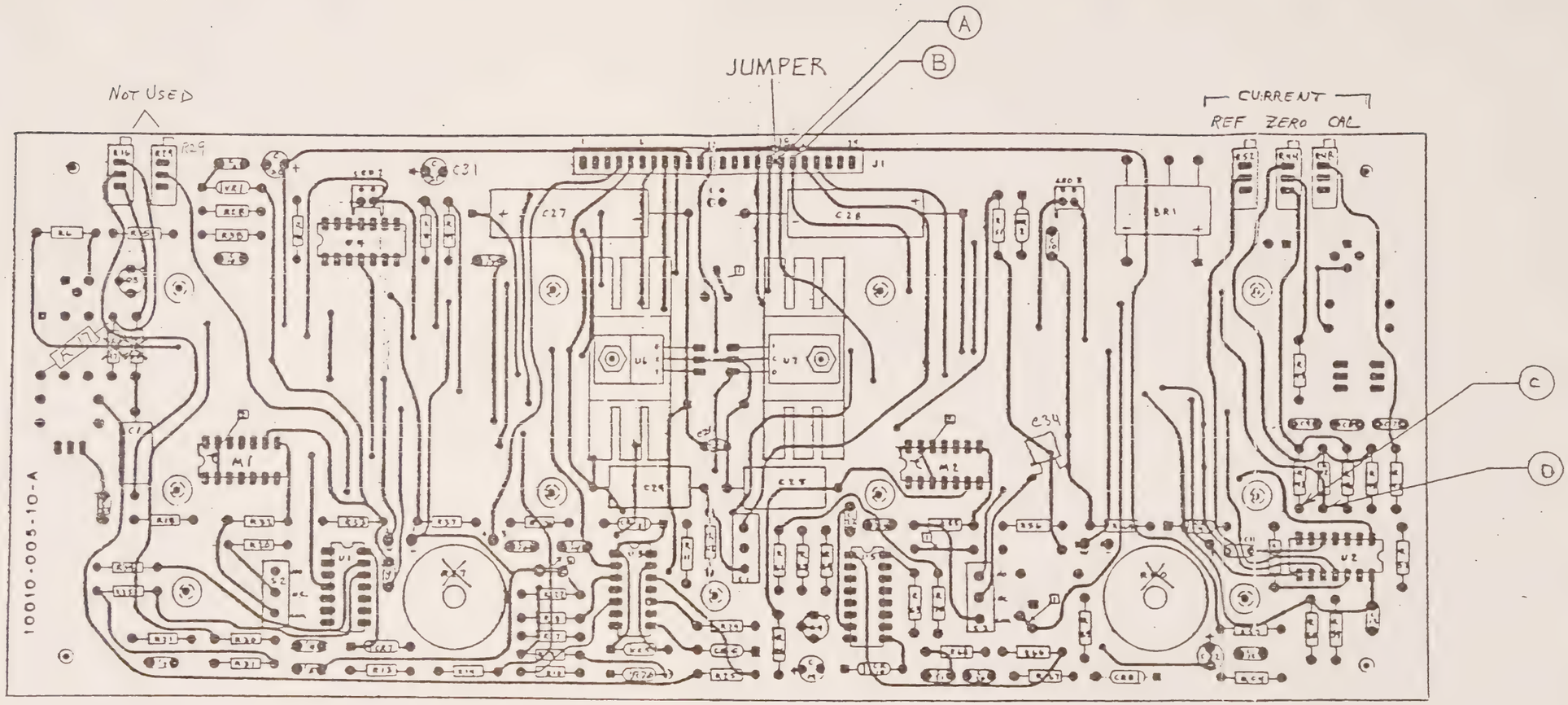
ITEM	SEQ.	DESCRIPTION	QTY	REFERENCE
~~7 079287 01~~				
~~10-001-004-01~~	1	SCHEMATIC,PWR SUPPLY	0.000	REFERENCE
12-070-005-20	2	HEATSINK (12040)	1.000	-
10-010-012-01	3	ASSY,CONTROL (20015)	1.000	A1
10-010-010-00	4	ASSY,PWR SWITCH (3204D-25	1.000	A2
~~10-020-027-00~~	~~5~~	~~ASSY,HARNESS (12040)~~	~~1.000~~	
08-010-001-00	6	BLOWER,230V,50/60HZ	1.000	B1
08-010-010-00	7	FAN FINGER GUARD	1.000	
07-040-008-00	8	BRIDGE,RECT. 60A,600V	1.000	BR1
01-038-735-10	9	CAP.ALUM 380UF,350V	1.000	C1
01-024-845-10	10	CAP.ALUM 2400UF,450V	1.000	C2
01-510-525-10	15	CAP.METAL POLY 1UF,250V	2.000	C3,4
~~07-080-005-00~~	~~16~~	~~DIODE,RECT. F.R. 5A,600V~~	~~2.000~~	~~CR1,CR2~~
06-050-002-00	20	INDUCTOR, 5MH,20A	1.000	L1
06-030-000-74	21	XFMR. 190-230V,3 PHASE	1.000	T1
~~09-030-003-00~~	~~23~~	~~BARRIER STRIP, 14 PIN~~	~~1.000~~	~~TB1~~
~~09-030-004-00~~	~~24~~	~~BARRIER STRIP, 4 PIN~~	~~1.000~~	~~TB2~~
~~09-090-001-00~~	~~25~~	~~JUMPER, OVER BARRIER, 2 P~~	~~4.000~~	
11-130-018-00	26	SHUNT,CURRENT 15A,50MV	1.000	R1
11-070-010-00	27	CIRCUIT BREAKER, 20A 3 PH	1.000	S1
~~12-070-002-00~~	~~29~~	~~CHASSIS, BASE (12040)~~	~~1.000~~	
~~12-280-001-00~~	~~31~~	~~CHASSIS, TOP, 7"H, 19" RA~~	~~1.000~~	
12-330-006-00	32	PANEL,FRONT	1.000	
01-900-003-00	34	CAP.MTG.CLIP 1 3/8"	1.000	
12-150-006-00	36	TIE MOUNTS	2.000	
12-150-005-00	37	LASHING TIE, RELEASABLE,	2.000	
15-500-440-13	38	STANDOFF,HEX 4-40 X 1/4"	4.000	
11-020-001-00	39	LED	2.000	LED2,3
11-021-001-00	40	LED, MTG. HARDWARE	2.000	LED2,3
11-050-001-00	41	METER, DIGITAL	2.000	M1,2
11-050-001-01	42	METER, BEZELS&FILTER	2.000	
12-180-001-00	45	HANDLE	2.000	
15-121-032-10	46	SOC CAP SCR 10-32X5/8 SS	4.000	
12-180-002-00	47	KNOB	2.000	
~~09-030-013-00~~	~~48~~	~~TERMINAL STRIP, 5 PT~~	~~1.000~~	~~TB3~~
07-100-000-07	49	SOCKET, 14 PIN DIP	2.000	
15-110-832-24	55	SCREW,PFH,8-32 X 1 1/2"SS	6.000	
15-100-832-06	56	SCREW,PPH,8-32 X 3/8"SS	16.000	
15-100-832-08	57	SCREW,PPH,8-32 X 1/2"SS	4.000	
15-400-800-00	58	WASHER,FLAT #8,SS	20.000	
15-420-800-00	59	WASHER,SPLIT #8,SS	20.000	
~~09-050-000-00~~	~~61~~	~~BINDING POST, RED~~	~~1.000~~	
~~09-050-000-01~~	~~62~~	~~BINDING POST, BLACK~~	~~1.000~~	
~~09-050-000-02~~	~~63~~	~~BINDING POST, GREEN~~	~~1.000~~	

NOTE 1. SEE L/M FOR VALUE

A1

SCHEMATIC, CONTROL ASSY 250-20

10010-012-91A1



[1] INSTALL HEADER (ITEM 4) WITH LARGE DIAMETER PINS TO PWB, SMALL DIAMETER PINS UP. 2 PLACES

[2] INSTALL AWG 22 BUS WIRE WHERE SHOWN. 3 PLACES.

NOTE : INSTALL TWISTED SHIELD CABLE : WHT FROM (A) to (C) ON TOP ASSEMBLY
BLK FROM (B) to (D)
LEAVE SHIELD OPEN (PUT SHRINK SLEEVE OVER SHIELD WIRE)

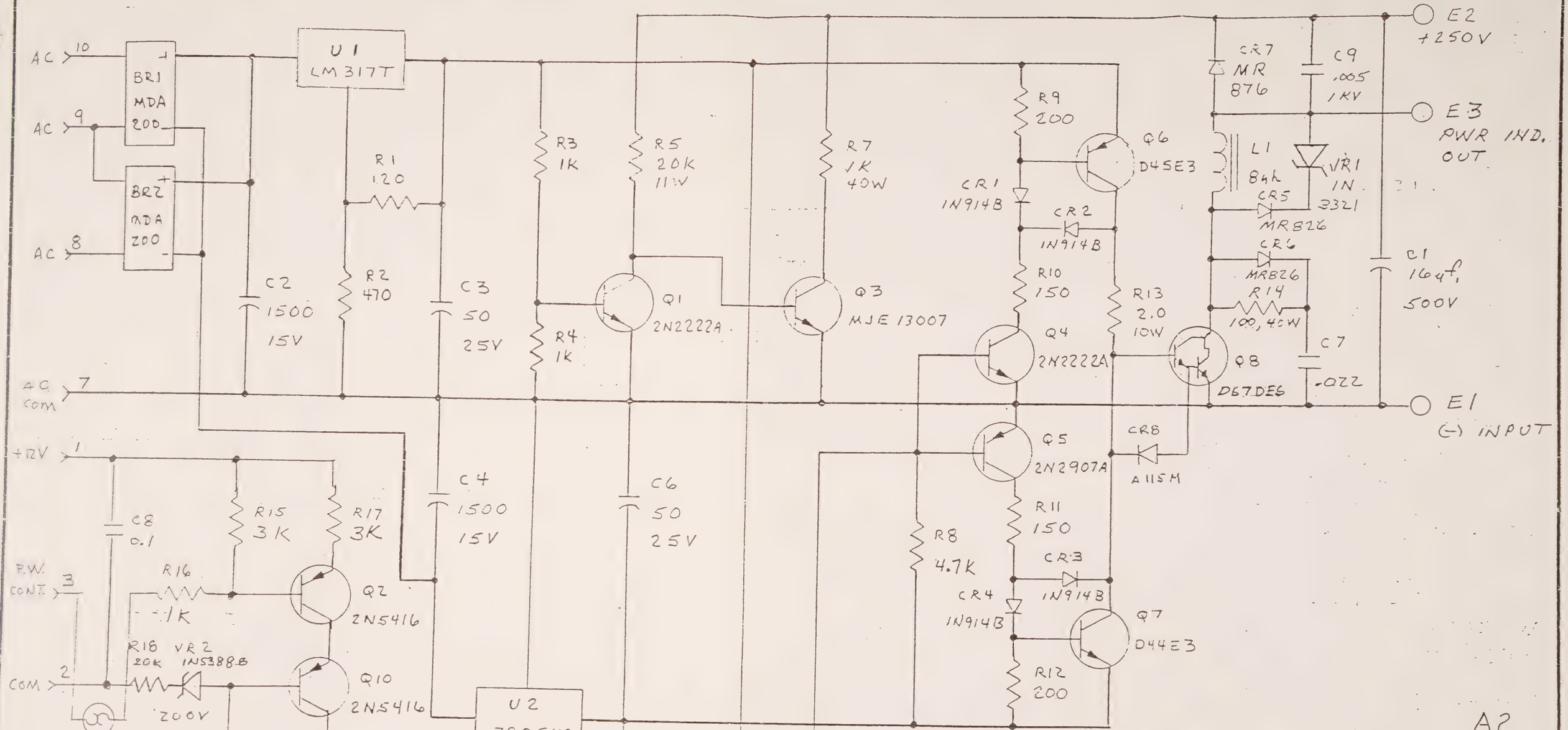
POWER TEN INC		
DATE 9-30-82	JBrown	REVISED
SCALE N/A		DATE
ASSY, CONTROL, 250-20		
10010-012-01 A		

BILL OF MATERIALS WITHOUT BURDEN
POWER TEN INC.
FOR ASSEMBLY 10-010-012-01

ITEM	SEQ.	DESCRIPTION	QTY	REFERENCE
10-010-012-91	1	SCHEMATIC,PWR SUPPLY	0.000	REFERENCE
10-010-005-10	2	PRINTED WIRING BOARD	1.000	-
12-050-000-07	3	BRACKET, COMP. MTG	1.000	-
12-050-000-06	4	BRACKET, HEATSINK, TO220	2.000	-
01-515-340-10	5	CAP.FILM .015UF,400V,10%	1.000	C1
01-210-450-00	6	CAP.CER .1UF,50V	10.000	C2-3,6,10-12,16-18,20
01-210-450-00	7	CAP.CER .1UF,50V	2.000	C23,26
01-247-120-10	8	CAP.CER 470PF,200V,10%	1.000	C5
01-210-120-10	9	CAP.CER 100PF,200V	3.000	C7,9,33
01-210-220-10	10	CAP.CER .001UF,200V,10%	2.000	C8,22
01-222-310-10	11	CAP.CER .022UF,100V,10%	1.000	C13
01-210-310-10	12	CAP.CER .01UF,100V,10%	2.000	C14,21
01-147-550-00	13	CAP.TANT 4.7UF,50V	4.000	C19,30,31,32
01-050-625-00	14	CAP.ALUM 50UF,25V	2.000	C24,25
01-050-725-00	15	CAP.ALUM 500UF,25V	2.000	C27,28
07-030-000-01	17	DIODE,RECT. 1A,50V	1.000	CR2
07-080-002-00	18	DIODE,SIG. 100MA,75V	8.000	CR3-10
07-040-012-00	19	BRIDGE,RECT. 2.5A,200V	1.000	BR1
03-103-021-00	20	RES. C.F., 3K,1/4W,5%	1.000	R64
07-020-000-01	21	XSTR.PNP. 500MA,40V	1.000	Q3
07-020-000-02	22	XSTR.NPN. 500MA,40V	1.000	Q4
03-101-021-00	23	RES. C.F., 1K,1/4W,5%	4.000	R5,45,46,66
03-105-121-00	24	RES. C.F., 5.1K,1/4W,5%	4.000	R6,10,31,65
03-101-031-00	25	RES. C.F., 10K,1/4W,5%	7 8.000	R7-9,12,25,[illegible],34,35
03-101-031-00	26	RES. C.F., 10K,1/4W,5%	7.000	R38,39,49,53,57-59
03-101-031-00	27	RES. C.F., 10K,1/4W,5%	2.000	R61,70
03-102-021-00	28	RES. C.F., 2.0K,1/4W,5%	3.000	R14,26,62
03-106-821-00	29	RES. C.F., 6.8K,1/4W,5%	1.000	R13
~~03-230-131-00~~	~~30~~	~~RES. M.F., 301K,1/4W,1%~~	~~1.000~~	~~R15~~
03-500-006-00	31	RES. TRIMPOT, 2K,1/2W	2.000	R16,44
03-101-041-00	32	RES. C.F., 100K,1/4W,5%	5 4.000	R18,20,63,68,30
03-102-211-00	33	RES. C.F., 220,1/4W,5%	2.000	R21,54
~~03-500-002-00~~	~~34~~	~~RES. POT., 10K~~	~~2.000~~	~~R27,50~~
03-103-611-00	35	RES. C.F., 360,1/4W,5%	2.000	R28,51
03-500-003-00	36	RES. TRIMPOT, 10K,1/2W	3.000	R29,48,52
03-215-411-00	37	RES. M.F., 1.54K,1/4,1%	1.000	R56
03-220-511-00	38	RES. M.F., 2.05K,1/4W,1%	1.000	R33
03-104-731-00	39	RES. C.F., 47K,1/4W,5%	1.000	R36
03-101-061-00	40	RES. C.F., 10M,1/4W,5%	2.000	R37,60
03-107-511-00	41	RES. C.F., 750,1/4W,5%	2.000	R40,41
03-101-001-00	42	RES. C.F., 10,1/4W,5%	2.000	R42,43
03-215-431-00	44	RES. M.F., 154K,1/4W,1%	1.000	R47
03-101-521-00	45	RES. C.F., 1.5K,1/4W,5%	2.000	R11,67
03-106-231-00	47	RES. C.F., 62K,1/4W,5%	1.000	R69
03-280-621-00	48	RES. M.F., 80.6K,1/4W,1%	2.000	R32,55
03-211-321-00	49	RES. M.F., 11.3K,1%,1/4W	1.000	R17
05-050-001-00	50	SWITCH, TOG. SPDT	1.000	S1
05-070-001-00	51	SWITCH, P.B. SPDT,MON	2.000	S2,3
07-100-000-07	52	SOCKET, 14 PIN DIP	4.000	
07-050-000-01	53	I.C. OP. AMP	4.000	U1,2,3,4
07-070-000-06	54	I.C. REG.	1.000	U5
07-070-000-05	56	I.C. REG. 1.5A,12V	1.000	U6
07-070-000-03	57	I.C. REG. 1.5A,5V	1.000	U7
07-100-000-20	58	SOCKET, 16 PIN I.C.	1.000	

BILL OF MATERIALS WITHOUT BURDEN
POWER TEN INC.
FOR ASSEMBLY 10-010-012-01

ITEM	SEQ.	DESCRIPTION	QTY	REFERENCE
07-100-000-09	59	DIP HEADER, 14 PIN, RD, T	2.000	
07-060-001-00	60	DIODE,REF. 9V	2.000	VR1,2
09-010-002-00	61	CONN. MALE 24 PIN, .1CTRS	1.000	
09-060-000-00	62	CONN. RECEPTACLE	2.000	
SD # 100176	63	CAP. CER DIP 1.0 UF 50V	1.000	C4



A2

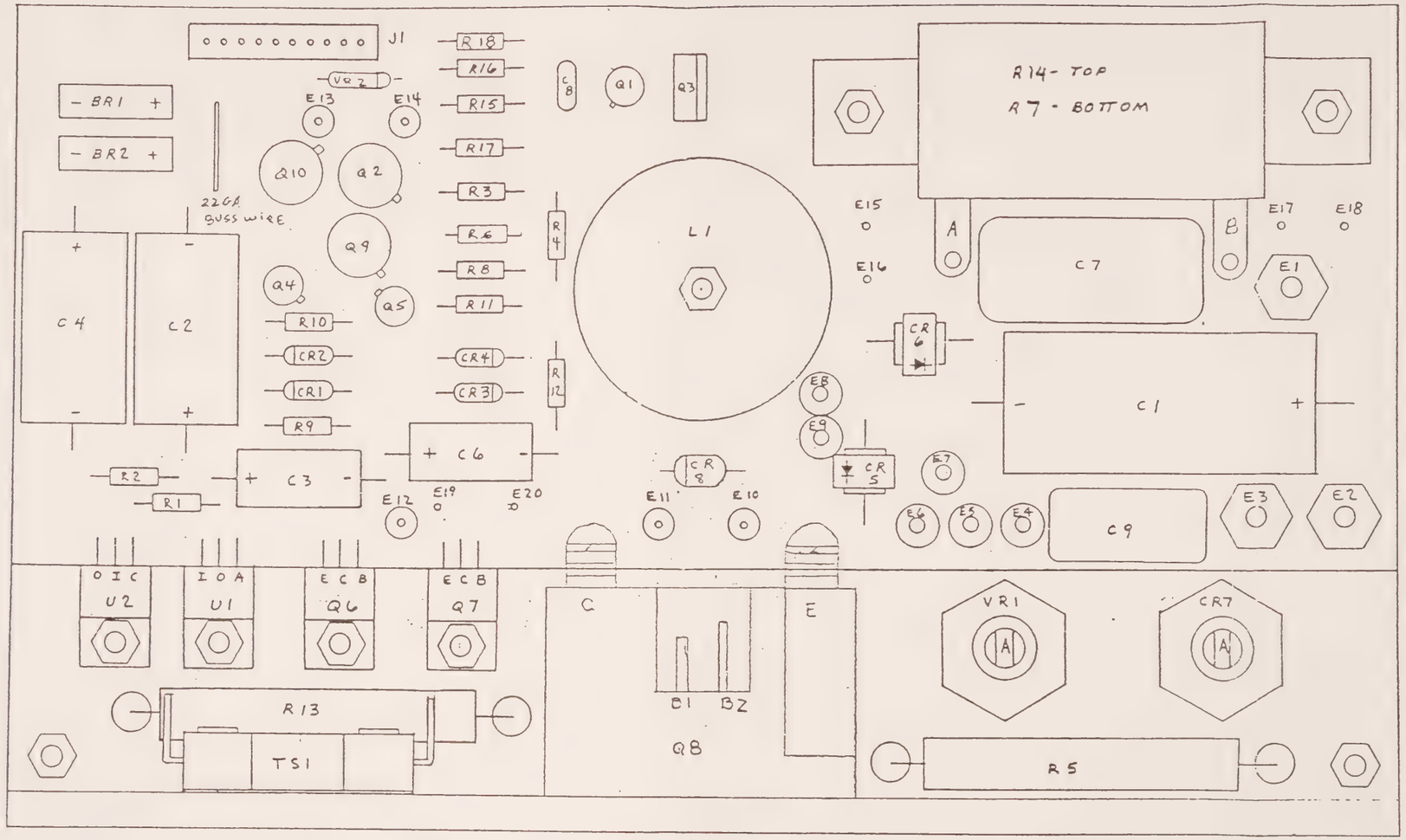
POWER TEN INC.
SANTA CLARA, CALIFORNIA 95054

SCALE: N/A	APPROVED BY: J Bow	DRAWN BY EB
DATE: 8/23/82		REVISED 07-01-83

SCHEMATIC, 250-20, PWR SWITCH

DRAWING NUMBER 10010-010-90C

11X17 PRINTED ON NO. 1000M-10 CLEAN-PRINT FADE-OUT



WIRING LIST

FROM	TO	AWG	REMARKS	FROM	TO	AWG	REMARKS
TS1-A	E13	22	.150 LUG TWISTED PAIR	Q8-C	E9	12	.250 LUG
TS1-B	E14	22		VR1-A	E5	12	
R7-A	E15	22		CR7-A	E3	12	
R14-A	E16	22		L1-A	E8	SELF	
R14-B	E17	22		L1-B	E3	SELF	
R7-B	E18	22		Q8-B2	E10	22	
Q8-E	E12	22					
Q8-B1	E11	22	.188 LUG				
Q8-E	E1	12	.250 LUG				

SAME LUG

POWER TEN INC.
SANTA CLARA, CALIFORNIA 95054

SCALE: N/A	APPROVED BY: J Bowen	DRAWN BY: JB
DATE: 9-22-82		REVISED 07-01-83 ND

ASSY, PWR SWITCH, 250 - 20

10010-010-00 C — DRAWING NUMBER

17733 PRINTED ON BO 1000H - HI CLEARPRINT FILM - DUT

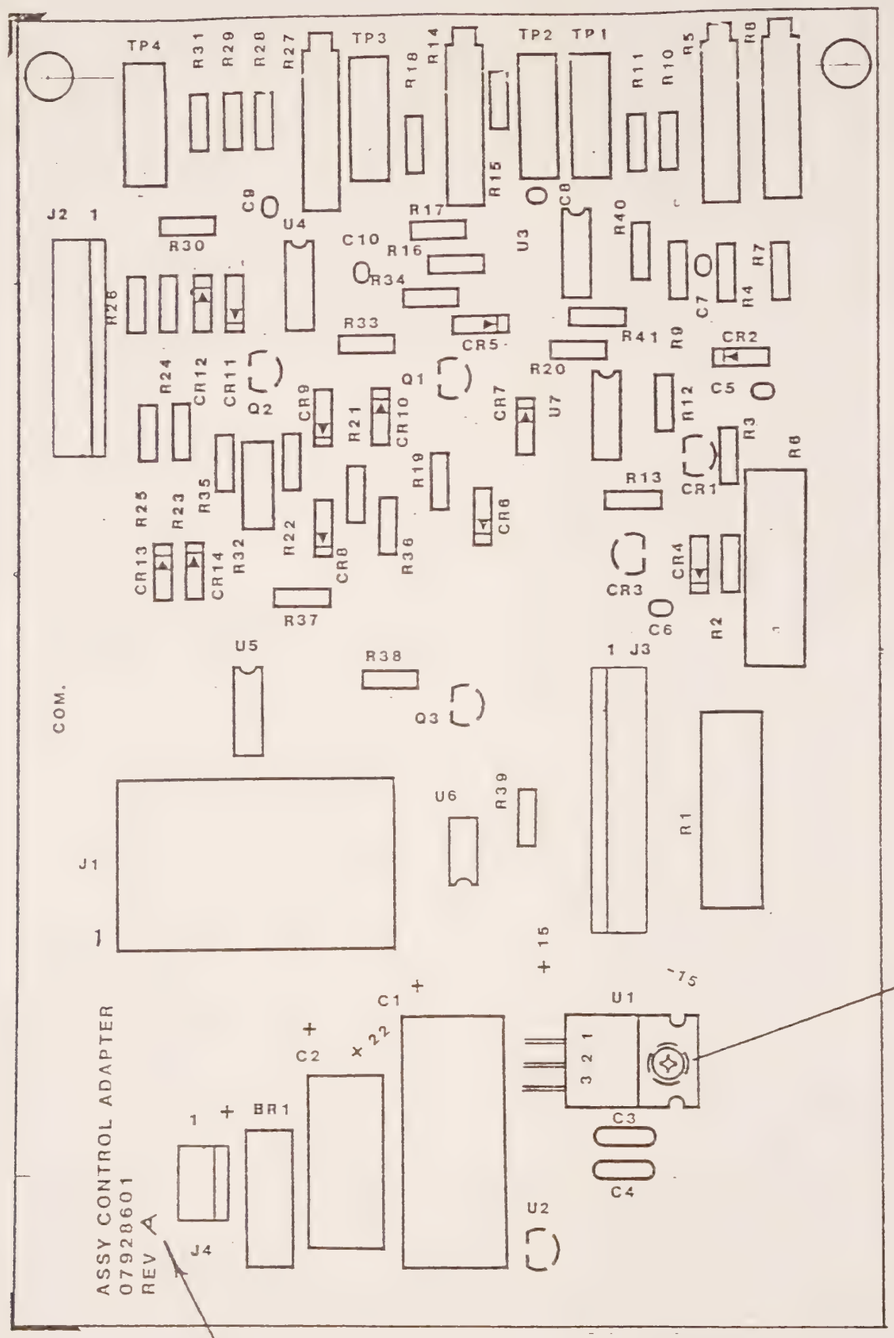
BILL OF MATERIALS WITHOUT BURDEN
POWER TEN INC.
FOR ASSEMBLY 10-010-010-00

ITEM	SEQ.	DESCRIPTION	QTY	REFERENCE
12-050-000-10	3	BRACKET, HEATSINK (12040)	1.000	
07-040-001-00	7	BRIDGE,RECT. 2A,50V	2.000	BR1,2
01-016-650-10	8	CAP.ALUM 16UF,500V	1.000	C1
01-015-815-00	9	CAP.ALUM 1500UF,15V	2.000	C2,4
01-050-625-00	10	CAP.ALUM 50UF,25V	2.000	C3,6
01-522-380-10	11	CAP.FILM .022UF,800V	1.000	C7
01-210-450-00	12	CAP.CER .1UF,50V	1.000	C8
01-550-210-20	13	CAP.FILM .005UF,1000V	1.000	C9
07-080-002-00	14	DIODE,SIG. 100MA,75V	4.000	CR1,2,3,4
07-080-005-00	15	DIODE,RECT. F.R. 5A,600V	2.000	CR5,6
07-080-006-00	16	DIODE,RECT. F.R. 50A,600V	1.000	CR7
07-080-003-00	17	DIODE,RECT. F.R. 5A,600V	1.000	CR8
06-050-006-00	18	INDUCTOR, 8UH,20A	1.000	L1
03-102-031-00	20	RES. C.F., 20K,1/4W,5%	1.000	R18
07-020-000-02	21	XSTR.NPN. 500MA,40V	2.000	Q1,4
07-020-000-05	22	XSTR.PNP. 1A,300V	2.000	Q2,10
07-010-000-05	23	XSTR.NPN. 8A,400V	1.000	Q3
07-020-000-01	24	XSTR.PNP. 500MA,40V	1.000	Q5
07-010-000-01	25	XSTR.DAR.PNP. 10A,80V	1.000	Q6
07-010-000-02	26	XSTR.DAR.NPN. 10A,80V	1.000	Q7
07-010-000-07	27	XSTR.DAR.NPN. 150A,450V	1.000	Q8
07-020-000-06	28	XSTR.NPN. 1A,350V	1.000	Q9
03-101-211-00	29	RES. C.F., 120,1/4W,5%	1.000	R1
03-104-711-00	30	RES. C.F., 470,1/4W,5%	1.000	R2
03-101-021-00	31	RES. C.F., 1K,1/4W,5%	3.000	R3,4,16
03-302-036-00	32	RES. W.W., 20K,11W,5%	1.000	R5
03-301-029-00	33	RES. W.W., 1K,40W	1.000	R7
03-104-721-00	34	RES. C.F., 4.7K,1/4W,5%	1.000	R8
03-101-511-00	35	RES. C.F., 150,1/4W,5%	2.000	R10,11
03-302-096-00	36	RES. W.W., 2,10W,1%	1.000	R13
03-301-019-00	37	RES. W.W., 100,40W	1.000	R14
03-103-021-00	38	RES. C.F., 3K,1/4W,5%	2.000	R15,17
03-102-011-00	39	RES. C.F., 200,1/4W,5%	2.000	R9,12
03-102-031-00	40	RES. C.F., 20K,1/4W,5%	1.000	R6
07-070-000-07	41	I.C. REG. 1.5A	1.000	U1
07-070-000-04	42	I.C. REG. 1.5A,-5V	1.000	U2
07-060-000-03	43	DIODE,ZEN. 24V,50W	1.000	VR1
09-010-001-00	44	CONN. MALE 10 PIN, .1 CTR	1.000	J1
05-090-002-00	45	SWITCH, THERMAL, NC 194F	1.000	S1
07-060-000-05	46	DIODE,ZEN. 200V,5W	1.000	VR2
15-520-000-00	47	SPACER,NYLON .2500D X .18	4.000	
07-100-000-04	48	INSULATOR, MICA, TO-127	4.000	
15-510-001-00	49	STANDOFF,ROUND 6-32,3/8"O	3.000	
15-110-440-10	50	SCREW,PFH,4-40 X 5/8"SS	2.000	
15-110-440-08	51	SCREW,PFH,4-40 X 1/2"SS	2.000	
15-100-440-08	52	SCREW,PPH,4-40 X 1/2"SS	6.000	
15-100-440-24	53	SCREW,PPH,4-40 X 1 1/2"SS	1.000	
15-100-632-06	54	SCREW,PPH,6-32 X 3/8"SS	6.000	
15-100-632-22	55	SCREW,PPH,6-32 X 1 3/8"SS	2.000	
15-400-400-00	56	WASHER,FLAT #4,SS	18.000	
15-400-600-00	57	WASHER,FLAT #6,SS ROD	10.000	
15-420-400-00	58	WASHER,LOCK #4,SS	11.000	
15-420-600-00	59	WASHER,SPLIT #6,SS	8.000	
15-300-440-00	61	NUT,HEX 4-40,SS	11.000	

BILL OF MATERIALS WITHOUT BURDEN
POWER TEN INC.
FOR ASSEMBLY 10-010-010-00

ITEM	SEQ.	DESCRIPTION	QTY	REFERENCE
15-300-632-00	62	NUT,HEX 6-32,SS	2.000	
07-100-000-14	63	WASHER, MICA, #1/4,DO-5	2.000	

REVISIONS					
REV	DESCRIPTION	ENG APP	ECO NO	DATE	APP BY
A	RELEASE TO RECORDS			1/26	KEM



PROPRIETARY DATA

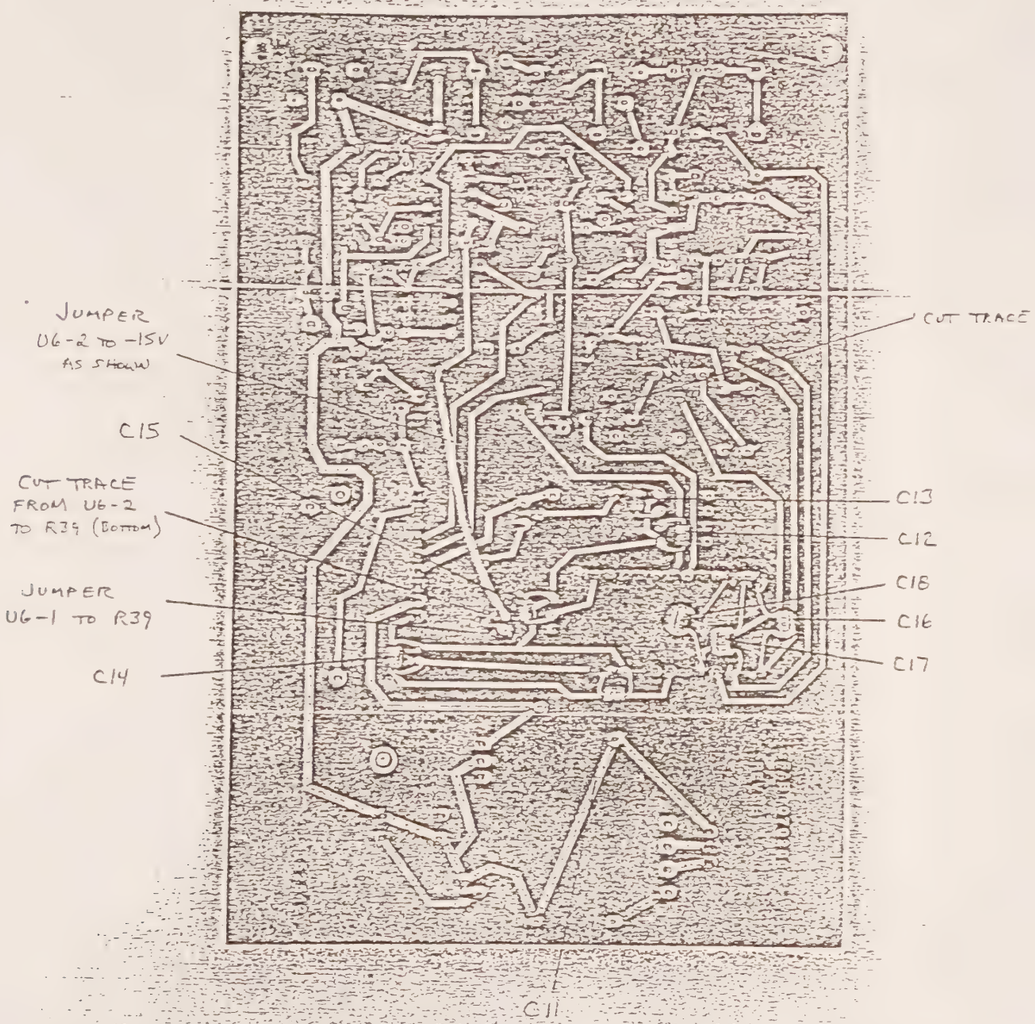
Furnished under United States Government Contract No. _____
Shall not be either released outside the Government or used duplicated or disclosed in whole or in part for manufacture or procurement without the written permission of Systron-Donner Corporation except for (1) emergency repair or overhaul work by or for the Government, where the item or process concerned is not otherwise reasonably available to enable timely performance of the work, or (2) release to a foreign government as the interests of the United States may require, provided that in either case the release use duplication or disclosure hereof shall be subject to the foregoing limitations. This legend shall be marked on any reproduction hereof in whole or in part

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO

LIST OF MATERIALS

DRAWN KB 7-28	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X XX ~ XXX ANGLES ~	SYSTRON DONNER CORPORATION CONCORD, CALIFORNIA	ASSY PCB CONTROL ADAPTER
CHECK DATE		CODE IDENT. 52542	
ELECT. DATE			
MECH. DATE		MATERIAL SEE P/L 07928601	DRAWING NO. REF SIZE PART NO REV: B 07928601 A
PROJECT Bill 10-28			
FPR200-15 Bill 2-8-29			
USED ON / NEXT ASSY	SCALE ~ DO NOT SCALE DRAWING	SH 1 OF 2	
APPLICATION			

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.



PROPRIETARY DATA

Furnished under United States Government Contract No. ____
Shall not be either released outside the Government, or used, duplicated or disclosed in whole or in part for manufacture or procurement, without the written permission of Bystron Donner Corporation except for (1) emergency repair or overhaul work by or for the Government where the item or process concerned is not otherwise reasonably available to enable timely performance of the work, or (2) release to a foreign government, as the interests of the United States may require, provided that in the case the release use duplication or disclosure hereof shall be subject to the following limitations: This restriction shall be marked on any reproduction hereof in whole or in part.

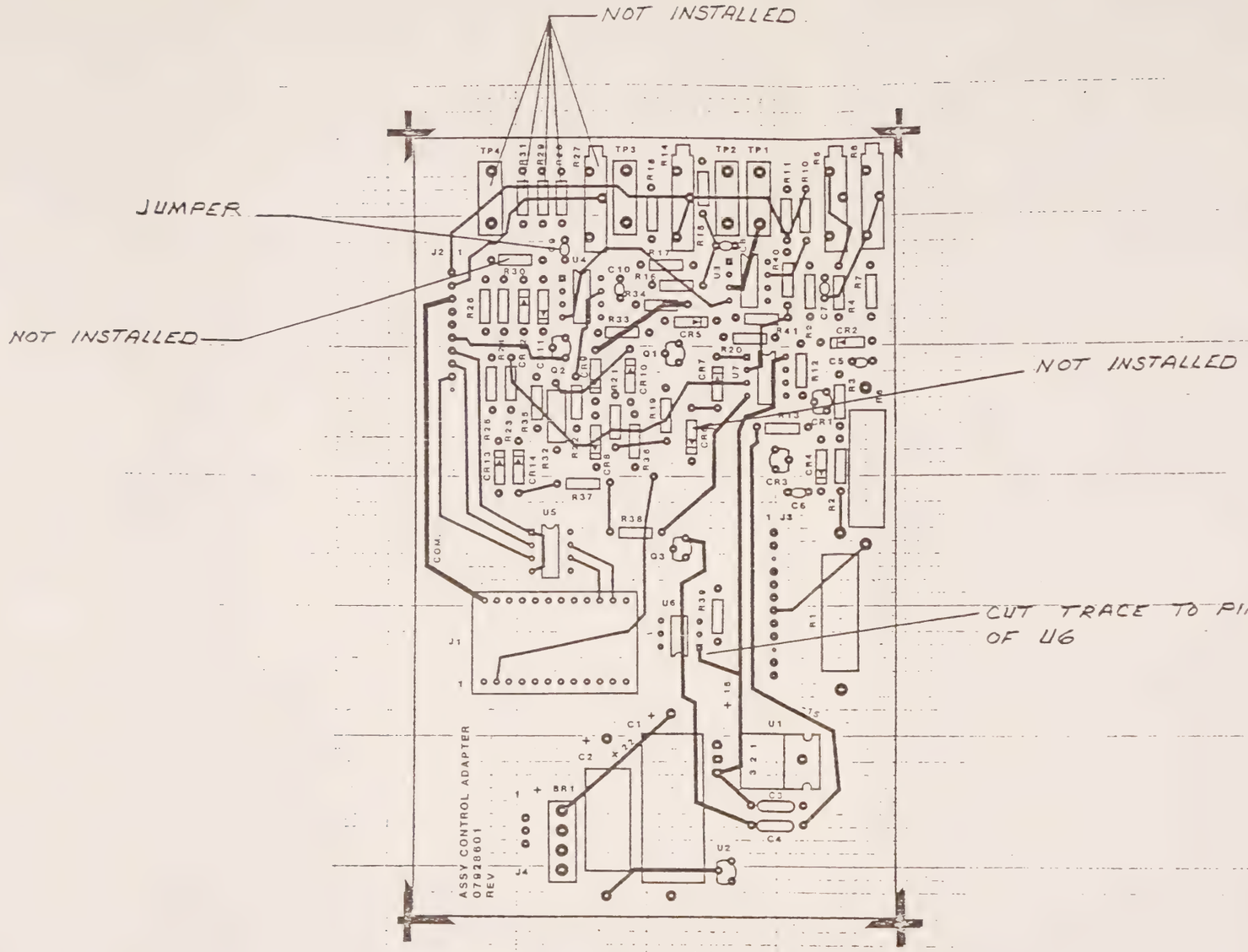
LIST OF MATERIALS

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

DRAWN	RWB 10-28	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	BYSTRON DONNER CORPORATION CONCORD CALIFORNIA
CHECK	DATE	DECIMAL TOLERANCE	
ELECT	DATE	.X ±	
MECH	DATE	.XX ±	
PROJECT MGR	DATE	.XXX ±	CODE IDENT 80542
QA	DATE	ANGLES ±	

ASSY PCB CONTROL ADAPTER 77200-15

NEXT ASSY | SCALE | DO NOT SCALE | MATERIAL | DRAWING NO. | REV.



ITEM NO	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO

LIST OF MATERIALS

PROPRIETARY DATA

Furnished under United States Government Contract No. _____
Shall not be either released outside the Government or used, duplicated, or disclosed in whole or in part for manufacture or procurement, without the written permission of Systron-Donner Corporation except for (1) emergency repair or overhaul work by or for the Government, where the item or process concerned is not otherwise reasonably available to enable timely performance of the work, or (2) release to a foreign government as the interests of the United States may require, provided that in either case the release use, duplication or disclosure hereof shall be subject to the foregoing limitations. This legend shall be marked on any reproduction hereof in whole or in part.

USED ON | NEXT ASSY
APPLICATION

DRAWN RB 10-7 DATE
CHECK DATE
ELECT. DATE
MECH. DATE
PROJECT DATE
QUALITY DATE
SCALE ~ DO NOT SCALE DRAWING
SH 2 OF 2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
X
XX
XXX
ANGLES ±

SYSTRON DONNER CORPORATION
CONCORD, CALIFORNIA
CODE IDENT 52542

MATERIAL

ASSY PCB CONTROL ADAPTER F7P200-15

DRAWING NO			
REF	SIZE	PART NO.	REV
	B	07928601	A

ASSY PC CONTROL ADAPTER F7P200 10/29/86 07928601 A-----A 3/19/86

INSTRUMENT DIV 52542 1

0001	079286	FAB PCB CONTROL ADAPTER F7P200	1-----1		1000	52542		EA	4 B
0010	11982501	DIODE RECT BRDG MDA101 100V 1A	A-----A	BR1	1000	04713	MDA101A	EA	4 V
0012	11981301	CAP EL AX 1000UF 35V -10+50%	A-----A	C1	1000	74840	108ITA035A	EA	4 V
0013	11982401	CAP EL AX 220UF 35V -20/75% <.	B-----A	C2	1000	74840	227ITA035A	EA	4 V
0014	100176	CAP CER DP 1UF 50V 20% Z5U .38	B-----A	C3,4	2000	56289	2C37Z5U105M050B	EA	4 V
0016	117570	CAP CER DP .01 UF 100V 20% X7R	F-----D	C5,6,	5000	04222	SR201C103MAA	EA	4 V
0016	99REF01	*** REF DESIG CONT FROM ABOVE		C16-18	000			00	9
0018	117641	CAP CER DP22PF 100V 5% COG .1L	C-----A	C7	1000	96733	DB448Y220J	EA	4 V
0019	117621	CAP CER DP 10PF 100V 5% COG	C-----C	C8	1000	96773	DB44BY100J	EA	4 V
0020	99REF86	WIRE JUMPER		C9	000	52542		00	9
0021	116501	CAP CER DP2200PF 100V 10% X7R	D-----D	C10	1000	96733	DB44BX222K	EA	4 V
0022	100178	CAP CER DP .1UF 50V 20% Z5U .3	F-----F	C11-15	5000	56289	2C37Z5U104M050B	EA	4 V
0023	123658	DIODE REF 2.5V 3% LM385Z-2.5_2		CR1,3	2000	27014	LM385Z-2.5	EA	4
0024	100385	DIODE SIG 1N4151 50V		CR2,4,5,	11000	03508	1N4151	EA	4
0024	99REF01	*** REF DESIG CONT FROM ABOVE		7-14	000			00	9
0030	11933801	SOCKET IC 24 PIN DIP PC MTG HI	C-----C	J1	1000	06776	ICT-246-S-TG	EA	4 V
0031	101377	XSTR SI NPN 2N3904 40V 100B300	A-----A	Q1,2	2000	04713	2N3904	EA	4 V
0033	101378	XSTR SI PNP 2N3906 40V 100B300	A-----A	Q3	1000	04713	2N3906	EA	4 V
0035	640560	RES WW PWR 10K 5W 5%		R1,6	2000			EA	4
0036	119172	RES 1.00M, 1%, MF		R2,3	2000	91637	CMF-55 T9	EA	4 V
0038	119135	RES MF 78.7K .1W 1% 25PPM/C		R4	1000	91637	CMF-55 T9	EA	4 V
0039	102473	POT 15T PC 5K 10% 3/8W CERM E	B-----A	R5,8	2000	73138	89PR5K	EA	4 V
0041	119140	RES MF 88.7K .1W 1% 25PPM/C		R7	1000	91637	CMF-55 T9	EA	4 V
0043	118998	RES MF 4.02K .1W 1% 25PPM/C		R9	1000	91637	CMF-55 T9	EA	4 V
0044	101609	RES CC 1/4W 100 OHM 5%		R10,17	2000	01121	CB1015	EA	4
0045	101569	RES CC 1/4W 1.0K 5%		R11,18,	3000	01121	CB1025	EA	4
0045	99REF01	*** REF DESIG CONT FROM ABOVE		36	000			00	9
0046	101687	RES CC1/4W560K 5%		R12,13	2000	01121	CB5645	EA	4
0048	102181	POT 15T PC 1K 10% 3/8W CERM E	B-----A	R14	1000	73138	89PR1K	EA	4 V
0049	119026	RES 7.50K 1% MF		R15	1000	91637	CMF-55 T9	EA	4 V
0050	119041	RES MF 10.0K .1W 1% 25PPM/C	A-----A	R16	1000	91637	CMF-55 T9	EA	4 V
0053	101598	RES CC 1/4W 4.7K 5%	B-----B	R19-21	3000	01121	CB4725	EA	4 V
0056	101570	RES CC1/4W 10K 5%		R22	1000	01121	CB1035	EA	4
0057	118967	RESISTOR, RN55E2051F		R23,25	2000	91637	CMF-55 T9	EA	4 V
0058	119032	RES MF 8.25K .1W 1% 25PPM/C		R24,26	2000	91637	CMF-55 T9	EA	4 V
0064	106363	RES MF 10.0K .12W .1% 50PPM		R32	1000	14298	EE-1/8 RN60C	EA	4
0065	11980401	RES MF 11.0K .1W .1% 50PPM/C		R33	1000		C=RN55C1102B	EA	4
0066	101616	RES CC1/4W 510 OHM 5%		R34	1000	01121	CB5115	EA	4
0067	101544	RES CC1/4W6.8K 5%	B-----B	R35	1000	01121	CB6825	EA	4 V
0069	101552	RES CC1/4W 15K 5%		R37,38	2000	01121	CB1535	EA	4
0071	101581	RES CC1/4W 1.2K 5%		R39	1000	01121	CB1225	EA	4
0072	123139	RES MF 100 .1W 1% 25PPM/C <.14	A-----A	R40	1000	91637	CMF-55 T9	EA	4 V
0073	123000	RES MF 150K 1% .1W 25PPM/C.14D		R41	1000	91637	CMF-55 T9	EA	4
0075	100520	TEST POINTBLACK PC MT PARALLE		TP1	1000	91506	8041-1G6	EA	4
0076	100528	TEST POINTGREY PC MT PARALLE		TP2,3	2000	91506	8041-1G10	EA	4
0080	103039	IC VOLTREG7815 15V 5%,1A,15W-.	A-----A	U1	1000	04713	MC7815CT	EA	4 V
0081	117261	IC VOLTREG79L15 -15.6/14.4V .0	A-----A	U2	1000	04713	MC79L15ACP	EA	4 V
0082	11982801	IC OP AMP LF412 JFET DUAL A>88		U3,4	2000	27014	LF412CH	EA	4
0084	102858	OPTOISOLTR CT6 DUAL IC/IF .2MI	B-----B	U5	1000	50522	MCT6	EA	4 V
0085	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	A-----A	U6	1000		4N37	EA	4 V

0086	11998501	IC LIN LM393A DUAL CMPTR 8PIN	U7	1000	27041	LM393AN	EA 4
0087	123220	CON PC PIN 10 STR HDR .1C-C FR	J2	1000	27264	22-11-2102	EA 4
0088	123729	CON PC PIN 12 STR HDR .1C-C FR	J3	1000	27264	22-11-2122	EA 4
0089	123219	CON PC PIN 3 STR HDR .1C-C FRI	J4	1000	27264	22-11-2032	EA 4
0090	100492	SPCR SWAGE4-40 .125L X.25RND .		1000	71279	1300-9	EA 4
0091	10062604	PHMS CRES 4-40 X 1/4		1000	96906	MS51957-13	EA 4
0092	100794	INT TOOTH #4 CRES		1000	96906	MS35333-70	EA 4

SINGLE LEVEL EXPLOSION

REV	DESCRIPTION	ECO NO.	LAL	DATE	APP BY
A	RELEASED TO RECORDS			10/86	

+V
FROM SHT. 1
-V

FL2
LINE
LOAD
STD-20
C4 1, 250V C5
C7 .05 500V
K1
P4 50Ω 50W
R3 50Ω, 50W
Q1 IRF333
C9 .01

J1
A +V
B
C -V
D
E -S
F +S
G GND
OUTPUT

P5
J1 3 2 1

A4
RELAY PCB
ASSY 07904007

P6
J2 2 3 6 7 5 4 9 8
-S +S

P3
J3 4 1 5 9 12 11 8 6 7 2
SD CLS CLFG FGCM +22

To A1-10 V CONTROL
-11 I CONTROL
-14 COM (-V)
-6 +S (FB)
SEE SHT. 1 -20 SHUTDOWN
-1 +
-3 CM FLAG
-2 VM FLAG

P2
9 8 7 3 5 4 6 1
J2

U5 MCT6

+15V
R40 100 1%
R41 150K 1%
-15V
LM393AM
U7

G2 2N3904
CR9
R21 4.7K
CR8
CR7
R19 4.7K
R20 4.7K
Q1 2N3904
CR5
R12 560K
CR1
LM385-2.5
CR2
CR4
C5 .01
+15V
R13 560K
CR3
-15V
C6 .01

R6 10K 5W
R1 10K 5W
R7 89.7K 1%
R2 1.0M 1%
R8 5K +SW BAL
R3 1.0M 1%
R4 78.7K 1%
R5 5K

R9 4.02K 1%
C7 22 pF
U3 LF412
-9.615 x (+SW)

R16 10K 1%
CB 10 pF
R17 100
U3 LF412
R15 7.5K 1%
R14 1K
R10 100
R11 1K
R18 1K
TP3 -SW
TP2 +SW
-SW CAL
+SW CAL

J2 P1 J1
1 COM 24
14 V CONTROL 1
2 COM 23
15 2
3 COM 22
16 I CONTROL 3
4 COM 21
17 4
5 20 NC
18 OV CONTROL 5
6 RST 19
19 6 NC
7 18
20 CLOSE 7 CLS
8 17 NC
21 8 NC
9 16 NC
22 9 NC
10 VM FLAG 15
23 GND 10 FGCM
11 CM FLAG 14
24 11
12 OV FLAG 13
25 CLSD FLAG 12
13 NC

R23 2.05K
R24 8.25K
R25 2.05K
R26 8.25K
C16 .01
C17 .01
1/3 LF412 U4

R22 10K
R33 11K .1%
R34 510
C10 .0022
R32 10K .1% R4960
1/2 LF412 U4
R36 1K
CR10
CR11
CR12
R35 6.8K
CR13
CR14
R37 15K
R38 15K
C11 .1
C12 .1
C13 .1
C14 .1
C15 .1
CLFG
-15V
U6 4N37
R39 1.2K
Q3 2N3906
LM393AM

A3
CONTROL ADAPTER PCB
07928601

+22V
U1 MC7815CT
U2 MC79L15ACP
C3 1. 50V
C4 1. 50V
C1 1000 μF 35V
C2 220 μF 35V
TP1 COMMON
BR1 MDA 101A
+15V
-15V
AC
AC

J4 P4
T2
504366
208V
SEE SHT. 1

UNLESS NOTED OTHERWISE
1. RESISTORS ARE 1/4W, 5%, COMP CARBON
2. DIODES ARE 1N4151.

To PROGRAMMER DAC-416

PROPRIETARY DATA
This document contains information which is proprietary to SYSTRON DONNER. The contents may not be used, copied, or divulged to other parties without written consent from an authorized representative of SYSTRON DONNER except in accordance with applicable Defense Acquisition Regulations

DRAWN	AJM	DATE	2-17-86
CHECK		DATE	
ENG.		DATE	
PROJECT ENG.		DATE	
FTP200-15 QA		DATE	
USED ON			
MATERIAL			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCE
.X ±
.XX ±
.XXX ±
ANGLES ±

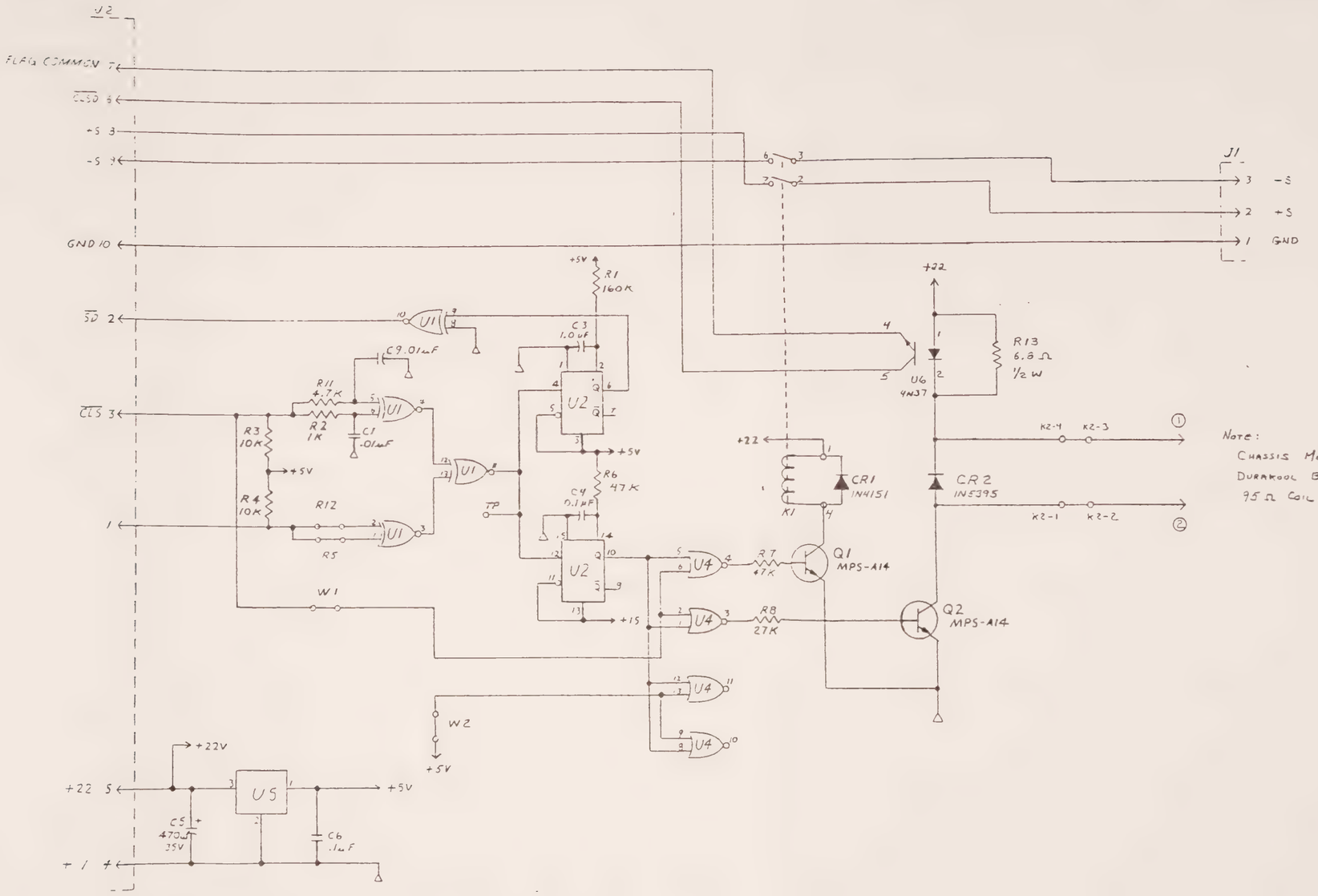
SYSTRON DONNER INSTRUMENT DIVISION
A THORN EMI company
2727 SYSTRON DRIVE CONCORD, CA 94518

SCHEMATIC
FTP200-15 POWER SUPPLY

SIZE	FSCM NO.	DWG. NO.	REV
D	52542	7 07928A1 01	A

SCALE

REV	DESCRIPTION	DATE	APP'D
A	RELEASE TO RECORDS		



Note:
CHASSIS MOUNTED RELAY IS
DURAKOOL BF2-7032
95 Ω COIL. SD P/N 123715

NOTES: 1) RESISTORS ARE ¼ W 5% CARBON COMP.
2) ⏚ DENOTES POWER COMMON.

CHART

IC	TYPE	COM	+5V
U1	74HC266	7	14
U2	145388	8	16
U3	NOT USED		
U4	140018	7	14
U5	MC78L05A		

PROPRIETARY DATA
This document contains information which is proprietary to SYSTRON DONNER. The contents may not be used, copied, or divulged to other parties without written consent from an authorized representative of SYSTRON DONNER except in accordance with applicable Defense Acquisition Regulations.

DRAWN	JES 11/27/84	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X ± XX ± XXX ± ANGLES ±
CHECK		
ENG		
PROJECT		
QA		
USED ON	EXP 2CD-25	
MATERIAL	P/L 07904007	

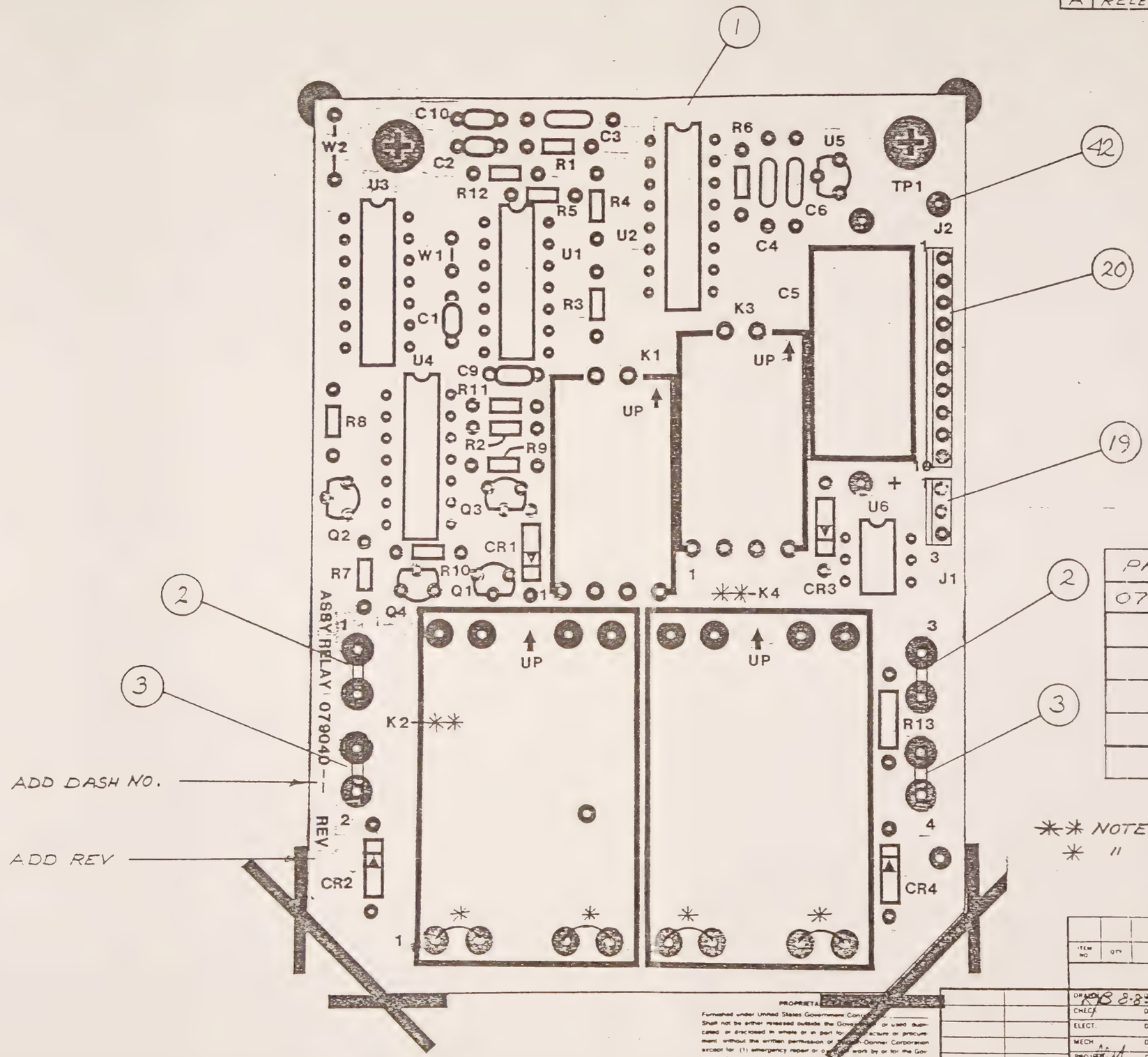
SYSTRON DONNER INSTRUMENT DIVISION
A TH-CAN FAR company
2727 SYSTRON DRIVE CONCORD, CA 94518

SCHEMATIC RELAY BOARD, SINGLE POLARITY
EXTERNAL RELAY

SIZE	FSCM NO.	DWG NO	REV
D	52542	7-07904007	A

SCALE ~ SHEET 1 OF 1

REVISIONS					
REV.	DESCRIPTION	ENGR NO.	ECO NO.	DATE	APP BY
A	RELEASE TO RECORDS			6-85	



PARTS LIST	MODEL	
07904001	QFP, HRP, HFP	
02		
05		
06		
07		
08		

** NOTE - K2 & K4 ARE AFTER SOLDER PARTS
* " - USE #20 AWG BUS - IF P/L SAYS TO USE JUMPERS IN PLACE OF K2 & K4

ITEM NO	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO

LIST OF MATERIALS

PROPRIETARY
Furnished under United States Government Contract. Shall not be either released outside the Government or used duplicated or disclosed in whole or in part for manufacture or procurement without the written permission of Systron-Donner Corporation except for (1) emergency repair or overhaul work by or for the Government where the item or process concerned is not otherwise reasonably available to enable timely performance of the work, or (2) release to a foreign government as the interests of the United States may require provided that in either case the release use duplication or disclosure hereof shall be subject to the foregoing limitations. This legend shall be marked on any reproduction hereof in whole or in part

DRAWN	RB 8-85	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X ± XX ± XXX ± ANGLES ±	SYSTRON DONNER CORPORATION CONCORD, CALIFORNIA
CHECK	DATE		
ELECT.	DATE		
MECH	DATE		
PROJECT	DATE		
QA	DATE		
USED ON: QFP	NEXT ASSY	SCALE 2/1	DO NOT SCALE DRAWING
APPLICATION		SH 1 OF 1	

ASSY PCB RELAY

CODE IDENT 52542

MATERIAL: SEE TABULATION

DRAWING NO. REF	SIZE	PART NO.	REV.
	B	079040TAB	A

ASSY PC RELAY SINGLE-POL EXTER 9/10/86 07904007 2-----2 3/19/86

INSTRUMENT DIV 52542 1

0001	079040	FAB PCB RELAY	D-----D		1000	52542		EA 4 B
0002	123280	CON 1CCT PC PIN .250W .032TH		1,3	2000	79963	836	EA 4
0003	123279	CON 1CCT PC PIN .187W .032TH		2,4	2000	79963	894	EA 4
0005	117570	CAP CER DP .01 UF 100V 20% X7R	F-----D	C1,9	2000	04222	SR201C103MAA	EA 4 V
0006	99REF50	*** REF DESN'TORS NOT USED ***		C2	000			00 9
0007	100176	CAP CER DP 1UF 50V 20% Z5U .38	B-----A	C3	1000	56289	2C37Z5U105M050B	EA 4 V
0008	100178	CAP CER DP .1UF 50V 20% Z5U .3	F-----F	C4,6	2000	56289	2C37Z5U104M050B	EA 4 V
0009	103383	CAP EL AX 470UF-10/+50% 35V .5	E-----E	C5	1000	74840	477TTA35A	EA 4 V
0011	99REF50	*** REF DESN'TORS NOT USED ***		C7,8,10	000			00 9
0015	100385	DIODE SIG 1N4151 50V		CR1	1000	03508	1N4151	EA 4
0016	100413	DIODE RECT1N5395 400V 1.5A.26L	A-----A	CR2	1000	04713	1N5395	EA 4 V
0017	99REF50	*** REF DESN'TORS NOT USED ***		CR3,4	000			00 9
0019	123219	CON PC PIN 3 STR HDR .1C-C FRI		J1	1000	27264	22-11-2032	EA 4
0020	123220	CON PC PIN 10 STR HDR .1C-C FR		J2	1000	27264	22-11-2102	EA 4
0022	119795	RELAY REED 24V 2FA HG 725R NO		K1	1000	95348	6522A-241-5	EA 4
0023	99REF86	WIRE JUMPER		K2	2000	52542		00 9
0024	99REF50	*** REF DESN'TORS NOT USED ***		K3,4	000			00 9
0026	106616	XSTR SIPNPMPSA14 30V B>10K@10M	A-----A	Q1,2	2000	04713	MPSA14	EA 4 V
0028	99REF50	*** REF DESN'TORS NOT USED ***		Q3,4	000			00 9
0030	101827	RES CC 1/8W 160K 5%		R1	1000	01121	BB1645	EA 4
0031	101711	RES CC1/8W1.0K 5%		R2	1000	01121	BB1025	EA 4
0032	101697	RES CC1/8W 10K 5%		R3,4	2000	01121	BB1035	EA 4
0034	102879	JUMPER, 22AWG INSULATED .09D		R5,12	2000	55210	L-2007-1	EA 4
0035	101694	RES CC1/8W 47K 5%		R6,7	2000	01121	BB4735	EA 4
0037	101952	RES CC 1/8W 27K 5%	A-----A	R8	1000	01121	BB2735	EA 4 V
0038	99REF50	*** REF DESN'TORS NOT USED ***		R9,10	000			00 9
0040	101792	RES CC1/8W4.7K 5%		R11	1000	01121	BB4725	EA 4
0041	106018	RES CC1/2W6.8 OHMS 5%		R13	1000	01121	EB68G5	EA 4
0042	117345	CON 1 CTPCPIN .04D .35L>.05MTG		TP1	1000	06776	CP-92-3	EA 4
0044	11979601	IC CMOS 74HC266 QUAD EXCL NOR	A-----A	U1	1000	27014	MM74HC266	EA 4 V
0045	116948	IC CMOS 14538 2*MONOMULIVIB	A-----A	U2	1000	04713	MC14538BCP	EA 4 V
0046	99REF50	*** REF DESN'TORS NOT USED ***		U3	000			00 9
0047	045283	IC CMOS 4001 QUAD-2IN NOR GA	A-----A	U4	1000	04713	MC14001BCP	EA 4 V
0048	117101	IC VOLTREG78L05 5V 5% <.4W@75C	A-----A	U5	1000	04713	MC78L05ACP	EA 4 V
0049	117530	OPTOISOLTR4N37 IC/IF>1 1KV <10	A-----A	U6	1000		4N37	EA 4 V
0051	99REF86	WIRE JUMPER		W1,2	000	52542		00 9
0060	707904007	SCHEM RELAY BD EXT RE SNGL POL	1-----1	REF	000	52542		00 9 D

SINGLE LEVEL EXPLOSION

www.manualsplus.com
1025220